MICRO FOCUS

Enterprise Sync 2.1

User's Guide for Mainframe Developers

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Contents

Introduction

Enterprise Sync delivers fast, efficient change management for mainframe development teams. By replicating mainframe source code to a distributed software configuration management platform, Enterprise Sync increases the effectiveness of parallel application development activities. Modern GUI-based tooling improves code change through automation, increased visibility, and simplified conflict and change resolution. Changes made to the distributed source management platform synchronize automatically with the mainframe software change management system. This ensures software change and configuration management processes and mainframe application source code remain the primary system of record.

There are two key parts to Enterprise Sync - the server piece that mirrors and synchronizes Endevor assets in a distributed platform, and the client tools that are driven from Enterprise Developer for z Systems that provide modern SCM tooling regardless of where the source resides - mainframe or distributed.

The components in the Enterprise Sync solution communicate with each other in the following manner:
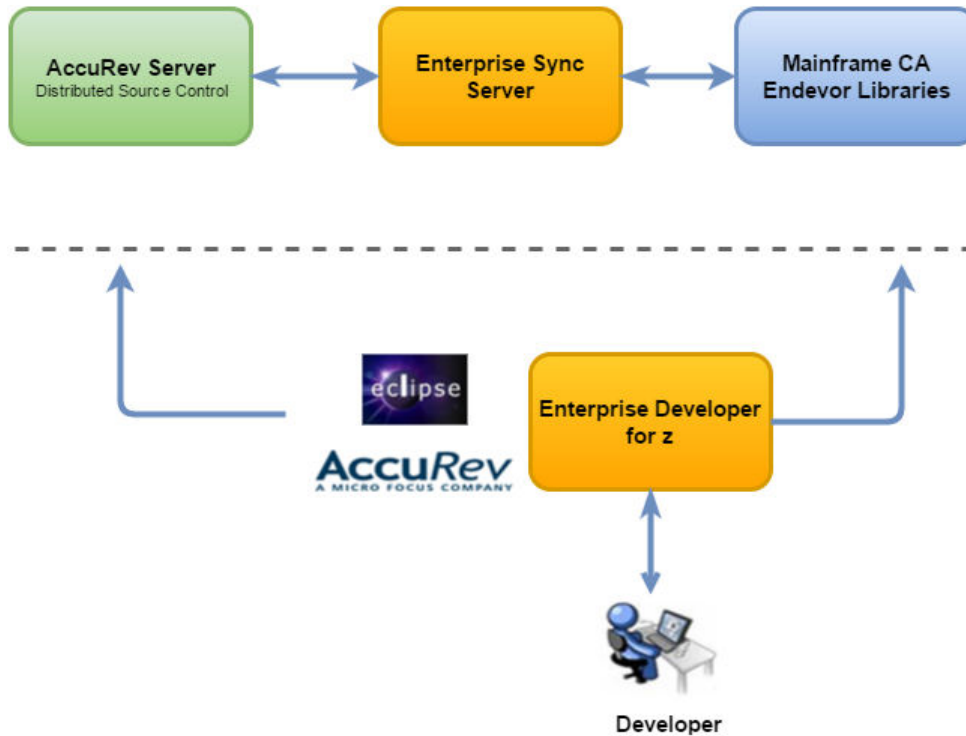
Audience

The book is intended for Enterprise Developer users, in particular, developers who will be using AccuRev on a daily basis, assuming that:

- CA Endevor Software Change Manager is used on the mainframe to manage all developed mainframe software assets.
- Enterprise Sync is used to mirror and synchronize the Endevor repository with AccuRev.
- The developer uses the advantages of a distributed SCM environment in combination with the Enterprise Developer IDE for developing, debugging and testing mainframe code locally.

Using This Guide

Before reading this book you should assure that:

- You are familiar working with Enterprise Developer mainframe COBOL or PL/I projects.

  If not, please walk through the Enterprise Developer mainframe tutorials first, which you will find in the *Micro Focus Documentation Info Center*. You must be familiar with the content explained in the tutorial *Getting started with Micro Focus Enterprise Developer for Eclipse*.

- You are familiar with accessing the mainframe using Enterprise Developer for z Systems

  If not, please walk through the Enterprise Developer mainframe tutorials first, which you will find in the *Micro Focus Documentation Info Center*. You must be familiar with the content explained in the *Remote Mainframe Development tutorial*.

- You have basic understanding of the Endevor concepts

  If not, you will find an Endevor overview on the Internet, for example in *Wikipedia*.

- You have basic understanding of the AccuRev concepts

  This book will show you how you can use AccuRev for your daily development work. To get a better understanding of the basic SCM concepts, if required, Micro Focus recommends to have a look into the *AccuRev Concepts Manual*.

- You have a basic understanding of the Enterprise Sync concepts.

The basic concepts how Enterprise mirrors and synchronizes software assets between Endevor and AccuRev are explained in the *Enterprise Sync Installation and Administration Guide*.

Based on a simple application sample the chapters in this book provide an introduction how file changes are managed consistently cross-platform in AccuRev and Endevor, how files are promoted through the stages until to the production stage and how parallel development is supported.

The Bankdemo Sample

The Bankdemo sample used in this book is a mainframe COBOL application based on VSAM and CICS.

This sample application is also used in the tutorials *Getting started with Micro Focus Enterprise Developer for Eclipse* and *Remote Mainframe Development tutorial* and you should be already familiar with this sample application.

In this book it is assumed that this Bankdemo application is managed in Endevor and mirrored and synchronized to AccuRev.

This chapter provides an overview how the Bankdemo system is managed in Endevor and AccuRev and how the synchronization rules are defined for this application.

The Bankdemo Application in Endevor

The following picture shows the Endevor stage structure used on the left and the relevant System/Subsystem/Types on the right:
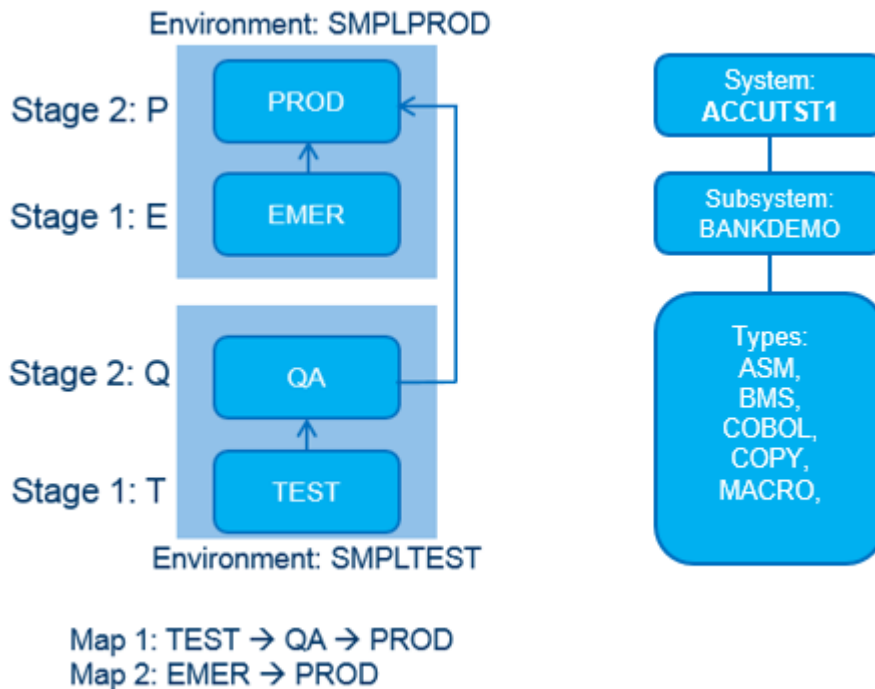
The following describes details of the Endevor configuration:

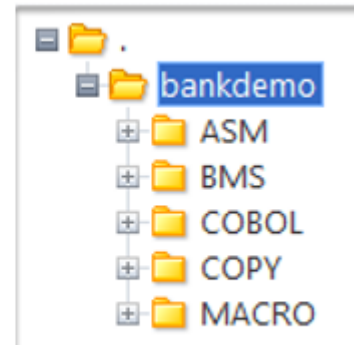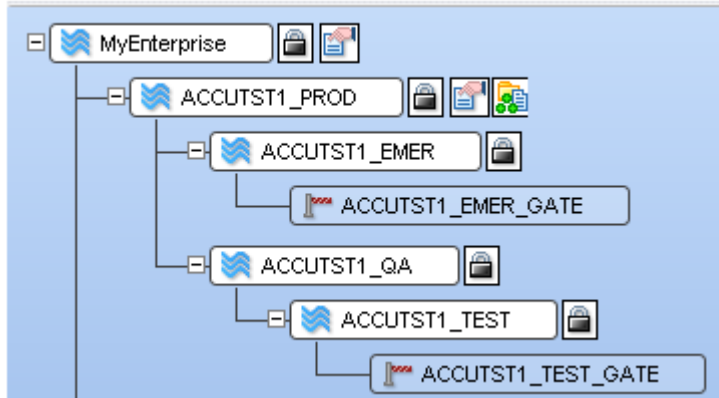| Endevor	Values	Description
Environment	SMPLPROD	Production Environment
	SMPLTEST	Development and Test Environment
Stage	Id: E Name: EMER Number: 1	Emergency stage in environment SMPLPROD.
	Id: P Name: PROD Number: 2	This production stage in environment SMPLPROD contains the complete Bankdemo sample application (COBOL, Assembler, Copybooks, Macros, BMS).
	Id: T Name: TEST Number: 1	Development and Test stage in environment SMPLTEST.
	Id: Q Name: QA Number: 2	QA stage in environment SMPLTEST.
Map	T → Q → P E → P	A Move from SMPLTEST stage TEST moves the elements to SMPLTEST stage QA. A Move from SMPLTEST stage QA moves the elements to SMPLPROD stage PROD. A Move from SMPLPROD stage EMER moves the elements to SMPLPROD stage PROD.
System	ACCUTST1	The name of a sample Endevor system, which contains the Bankdemo application as a subsystem.
Subsystem	BANKDEMO	The name of a sample Endevor subsystem.
Type	COBOL	COBOL programs
	ASM	Assembler programs
	COPY	COBOL copybooks
	MACRO	Assembler Macros
	BMS	BMS sources
	...	Additional available types are not relevant in this book, but may be visible on some screenshots
Processor Group	CLENBL	COBOL LE Batch program
	CICS	COBOL CICS program
	CICSSP	COBOL CICS using CICS(SP) option
	COBCOPY	COBOL copybook
	ASMNBL	Assembler
	BMS	BMS Source
	NOPROC	Used for Assembler Macro, COBOL Copybooks

The Bankdemo Application in AccuRev

The following picture shows the AccuRev stream structure used on the left and the relevant folder structure on the right:

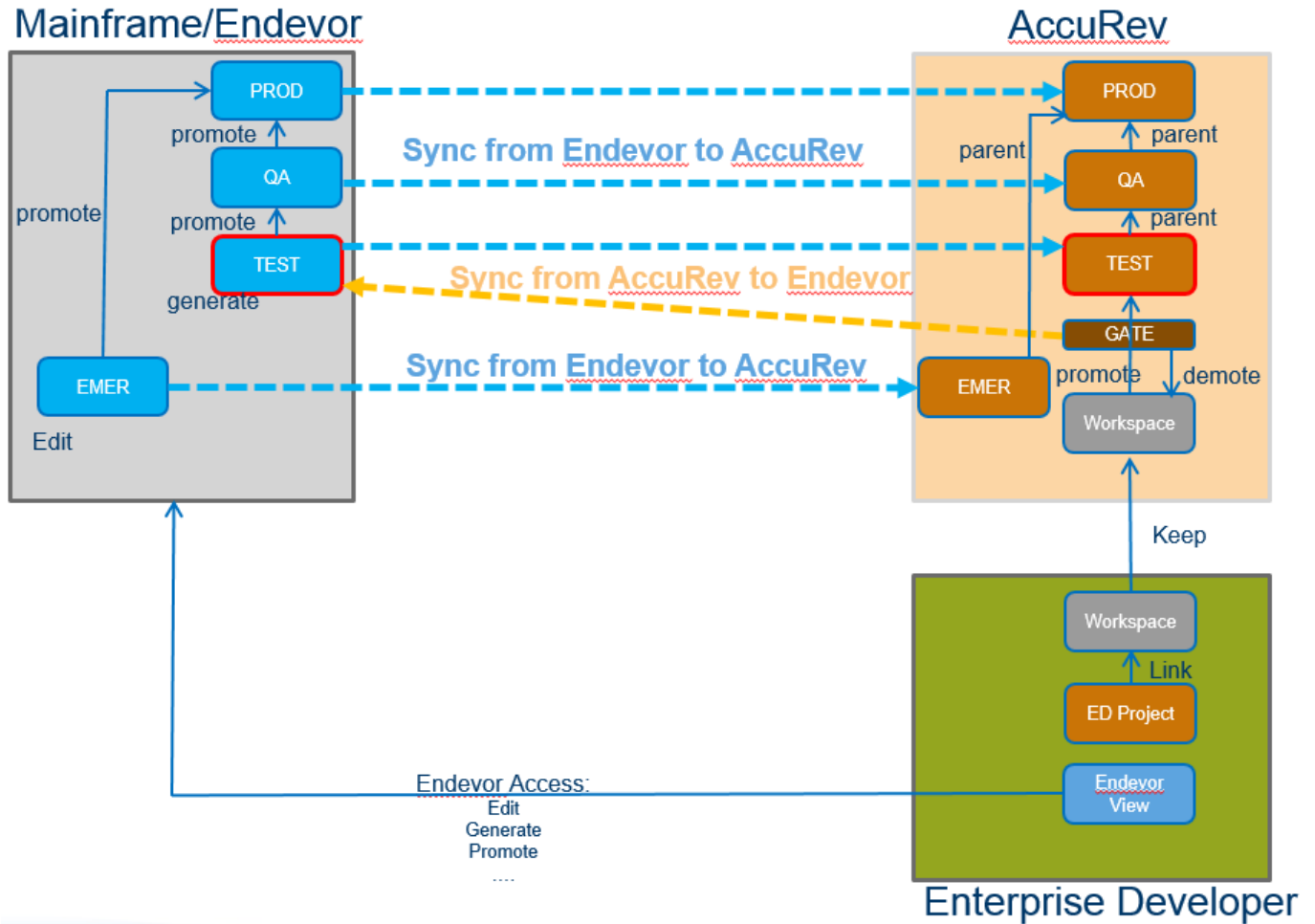The table below describes details of the configuration:

AccuRev	Values	Description
Depot	MyEnterprise	The main repository
Streams	MyEnterprise	The root stream, which does not contain have any content.
	ACCUTST1_PROD	The production stream, the current versions of the elements are in sync with the corresponding Endevor elements of the BANKDEMO Subsystem in stage PROD.
	ACCUTST1_EMER	The emergency stream, the current versions of the elements are in sync with the corresponding Endevor elements of the BANKDEMO Subsystem in stage EMER.
	ACCUTST1_EMER_GATE	A gated stream which is used to support the on-demand synchronization when promoting from the AccuRev workspace to the EMER stream
	ACCUTST1_TEST	The test stream, the current versions of the elements are in sync with the corresponding Endevor elements of the BANKDEMO Subsystem in stage TEST.
	ACCUTST1_TEST_GATE	A gated stream which is used to support the on-demand synchronization when promoting from the AccuRev workspace to the TEST stream
	ACCUTST1_QA	The QA stream, the current versions of the elements are in sync with the corresponding Endevor elements of the BANKDEMO Subsystem in stage QA.
	ACCUTST1_DEVTESTn	A backing stream used to develop release n of the Bankdemo application (n used for parallel development)
Stream Hierarchy	ACCUTST1_PROD ACCUTST1_QA ACCUTST1_TEST ACCUTST1_TEST_GATE	Bankdemo release development for scenarios where no parallel development is done in AccuRev. The user's workspace is attached to the gated stream. Promotes to TEST are synchronized to the Endevor TEST stage on-demand. Promotes to QA or PROD are executed in Endevor and synchronized to AccuRev.
	ACCUTST1_PROD ACCUTST1_QA ACCUTST1_TEST ACCUTST1_TEST_GATE ACCUTST1_DEVTESTn	Bankdemo release development for scenarios where parallel development is done in AccuRev. The user's workspace is attached to the DEVTESTn streams. Promotes to DEVTESTn trigger an off host build (e.g. for ETS). Promotes to the gated stream are synchronized to the Endevor TEST stage. Promotes to QA or PROD are executed in Endevor and synchronized to AccuRev. (n = 1,2,3,… number of parallel development environment, if required, otherwise only DEVTEST could be used)
	ACCUTST1_PROD ACCUTST1_EMER ACCUTST1_EMER_GATE	It is assumed that emergency changes are done in Endevor and synchronized to the corresponding AccuRev streams EMER and PROD. Anyhow, emergency changes are supported in AccuRev as well.
Folders	COBOL	COBOL programs
	ASM	Assembler programs
	COPY	COBOL copybooks

	MACRO	Assembler Macros
	BMS	BMS sources
File extensions	cbl	COBOL
	cpy	COBOL Copybooks
	mac	Assembler macros
	bms	BMS macros

The AccuRev Endevor Synchronization Rules/ Configurations

The following picture gives an overview of the configured synchronization and how a user will access Endevor and AccuRev in Enterprise Developer. This picture describes the scenario where no parallel release development is used.
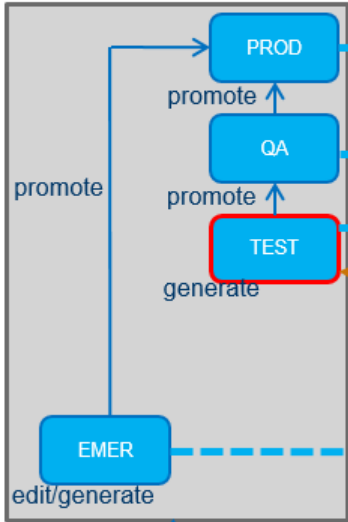

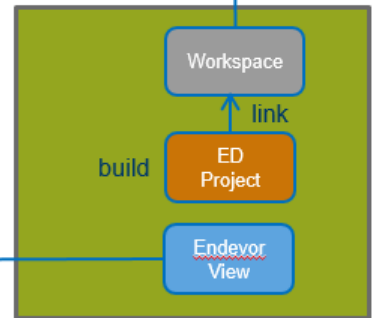The table below describes the synchronization rules configured:

Mapping	Endevor	Dir.	AccuRev
(Sub-)System / Depot	ACCUTST1 BANKDEMO		The Endevor subsystem BANKDEMO in system ACCUTST1 is mapped to the AccuRev depot MyEnterprise. The subsystem BANKDEMO is a high level folder in the corresponding streams.
Stage/Stream	PROD	→	ACCUTST1_PROD Synchronization from Endevor to AccuRev
	QA	→	ACCUTST1_QA Synchronization from Endevor to AccuRev
	TEST	←→	ACCUTST1_TEST Bi-directional synchronization. File changes are promoted via the gated stream to the stream ACCUTST1_TEST in AccuRev and synchronized to Endevor. Promotes from the Endevor stage TEST to stage QA or updates in stage TEST require a synchronization from Endevor to AccuRev.
	EMER	←→	ACCUTST1_EMER Bi-directional synchronization. File changes are promoted via the gated stream to the stream ACCUTST1_EMER in AccuRev and synchronized to Endevor. Promotes from the Endevor stage EMER to stage PROD or updates in stage EMER require a synchronization from Endevor to AccuRev.
Type / File Extension	ASM		asm
	BMS		bms
	COBOL		cbl
	COPY		cpy
	MACRO		mac

The picture below is similar to the previous one but illustrates a scenario with an additional stream level where teams could work in AccuRev on parallel releases of the Bankdemo application. The DEVTESTn streams could be connected to special test environments off the host without synchronizing at this level with Endevor:

Mainframe/Endevor

AccuRev

PROD

promote

QA

promote

TEST

generate

EMER
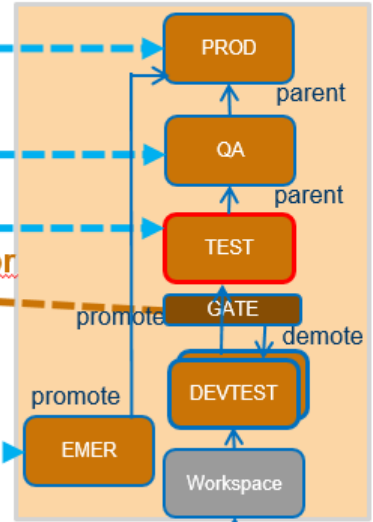
edit/generate

Sync from Endevor to AccuRev

Sync from AccuRev to Endevor

Sync from Endevor to AccuRev

PROD

parent

QA

parent

TEST

GATE

promote

demote

DEVTEST

promote

EMER

Workspace

Keep

Endevor Access:
Edit
Generate
Promote
....

Enterprise Developer

Workspace

link

ED
Project

build

Endevor
View

Using AccuRev and Endevor with Enterprise Developer

With Enterprise Sync you can configure and implement an automatic process which keeps Endevor and AccuRev objects in sync.

Depending on the degree of maturity of the existing application development process, different scenarios can be implemented as a starting point, supporting developers with a modern IDE based on Enterprise Developer and Enterprise Sync.

- You could use Enterprise Developer for developing and testing on the mainframe only using the full supported Endevor integration. Already in this scenario the synchronization of the Endevor elements with AccuRev would provide most of the advantages described below. This alternative might be a good starting point if the mainframe developers were using ISPF before and are not familiar with modern Eclipse based IDEs.
- If you would like to be more independent from the other team developers, or you want to take the full advantage of unit testing using the Enterprise Developer mainframe project support, using the AccuRev controlled file management is recommended. Promoting your unit tested files to an AccuRev stream which is directly synchronized with Endevor would be a good approach in this scenario. The team's integration test could be still supported on the mainframe.
- You could also want to take advantage of AccuRev working in parallel or to support an integration test environment off the mainframe based on the Micro Focus Enterprise Test Server. To support this you would consider to add additional AccuRev stream levels below the stream which is used as the synchronization point to Endevor.

Although the last scenario provides the best support by combining an integrated distributed SCM process with a mainframe SCM tool, it is crucial to understand that Enterprise Sync doesn't require you to implement this step initially. The Micro Focus enterprise product offerings based on Enterprise Developer, Enterprise Analyzer, Enterprise Server, Enterprise Test Server and Enterprise Sync allow introducing a long-term, incremental migration process from an ISPF-based development environment to a modern Eclipse-based development environment.

In this context, Enterprise Sync is an important component which extends the existing mainframe SCM features to the distributed platform without the pre-requisite to first migrate from the mainframe SCM system to a new distributed SCM system. Instead, the objects of the mainframe SCM system are kept in sync with the distributed SCM system.

Benefits

The main benefits provided by mirroring and synchronizing Endevor with AccuRev are summarized below.

No process changes are enforced with Enterprise Sync

Synchronizing the Endevor elements with AccuRev greatly simplifies the implementation of new mainframe processes like *unit testing, continuous integration*, and *parallel development* in a consistent and integrated manner. In any case, no process changes are enforced with Enterprise Sync. The administrator could start deploying an Enterprise Developer based mainframe development environment with a process that is similar to the old process, thus, inuring the developers with a new, modern IDE with all its known productivity enhancements. The combination with Enterprise Sync provides already in this scenario provides significant value, e.g. improved auditing, versioning, comparison, merging and graphical visualization.

Improved auditing

All changes done in AccuRev are logged, so the developer will find the complete history of all SCM events in AccuRev. This is different to Endevor where it is common that history records are deleted, i.e. when deleting or moving an element.

Time	Action	User	#	Version	Comment
2016 Jun 20 09:58:49	promote	syncuser	10814	PROD/3	PROMOTE FROM QA TO PROD...
2016 Jun 20 09:58:49	keep	syncuser	10813	accWsNDV2ACCPRODsyncuser_syncuser/2	PROMOTE FROM QA TO PROD...
2016 Jun 20 09:58:49	promote	syncuser	10812	PROD/2	promoting MFIUPH/BANKDEMO/COBOL/BBANK50P.cbl from QA to PROD
2016 Jun 20 09:44:28	keep	admin	10811	BANKDEMO_TEST_admin_admin/3	Save in Private Workspace
2016 Jun 20 09:42:58	keep	admin	10810	BANKDEMO_TEST_admin_admin/2	Save in Private Workspace
2016 Jun 20 06:52:55	promote	syncuser	10809	QA/2	PROMOTE FROM TEST TO QA...
2016 Jun 20 06:52:55	keep	syncuser	10808	accWsNDV2ACCQAsyncuser_syncuser/1	PROMOTE FROM TEST TO QA...
2016 Jun 20 06:52:55	promote	syncuser	10807	QA/1	promoting MFIUPH/BANKDEMO/COBOL/BBANK50P.cbl from TEST to QA
2016 Jun 17 15:52:19	promote	admin	10797	TEST/1	Promote to TEST
2016 Jun 17 15:52:19	keep	admin	10796	BANKDEMO_TEST_admin_admin/1	Promote to TEST
2016 Jun 17 10:27:01	promote	syncuser	10788	PROD/1	initial sync change set...
2016 Jun 17 10:26:59	add	syncuser	10787	accWsNDV2ACCPRODsyncuser_syncuser/1	INJECTION initial sync change set...

PROMOTE FROM QA TO PROD

bcTransactionType:APPLY

Element	Vir Ver	Real Ver	Ancestor	Merge	Patch	Issues
\.\meta\MFIUPH\BANKDEMO\COBOL\.BBANK50P.cbl.meta	PROD/3	accWsNDV2ACCPRODsyncuser_syncuser/2				
\.\MFIUPH\BANKDEMO\COBOL\BBANK50P.cbl	PROD/3	accWsNDV2ACCPRODsyncuser_syncuser/2				

Improved versioning

For each change in AccuRev, the developer can easily access the corresponding source file version. Unlike Endevor, AccuRev manages a complete history of all files and based on the information shown in the history list (see above) which makes it much easier to locate a specific file version of interest. A graphical version browser is supported, and the corresponding files can be directly accessed from this browser.
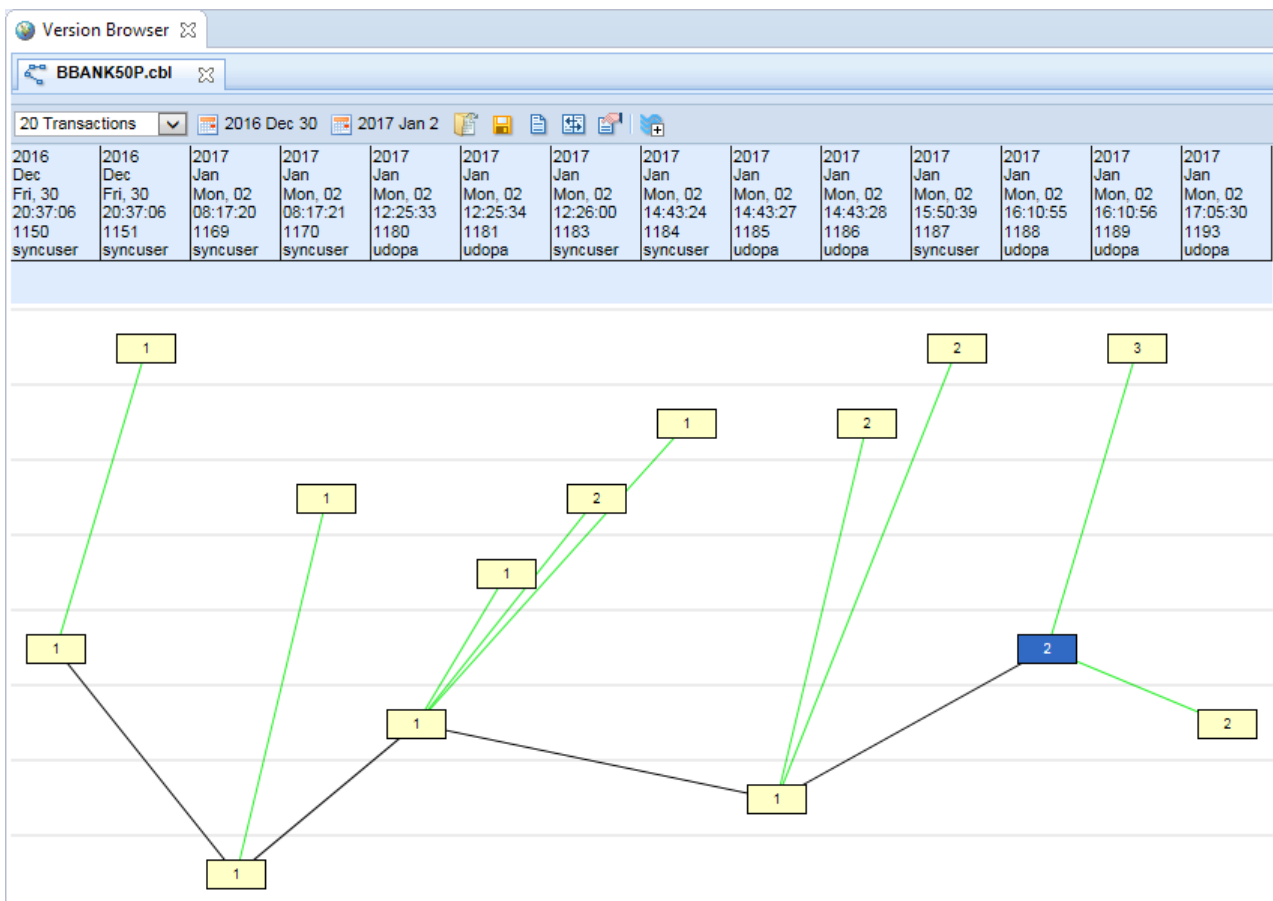
Improved analysis of file changes (annotate)

Using the AccuRev `Annotate` function on any file version provides the developer with a complete line oriented history of all changes within the file (record level).
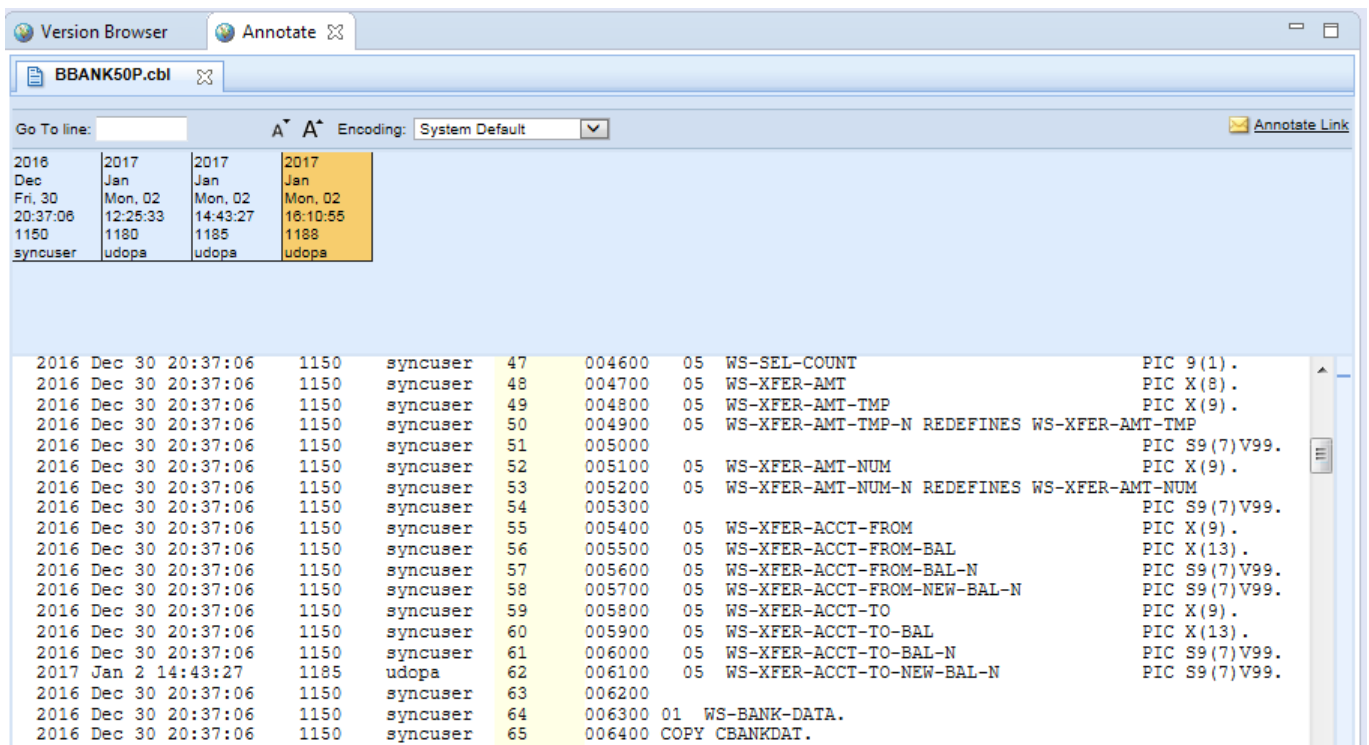
Improved comparison and merge support

Any two history files managed in AccuRev can be compared directly and, if required, merged into a new workspace version.

The benefits described above are directly available, even if the development process is not changed, meaning the developer would still do all changes on the mainframe either in ISPF or using Enterprise Developer with the AWM Endevor Attachment. Below are the advantages summarized which are available when moving parts of the development process off the host. Again, these advantages could be introduced step-by-step.

Improved conflict detection and resolution

Source conflicts that typically occur as a result of parallel development are automatically detected by AccuRev, and the developer is prompted to resolve the conflict.

Improved Unit Testing and CI support

To be able to support Unit Testing and Continuous Integration (CI) off the host, it is a pre-requisite In that the Build process compiles the sources with the same options used and managed on the mainframe. This includes accessing the correct versions of dependent files (e.g. COBOL Copybooks).

Enterprise Sync ensures the consistency between Endevor and AccuRev, therefore any builds triggered from AccuRev will use the correct compiler options and will access the correct versions of the dependent files.

Supporting parallel development

By adding additional parallel streams under the Endevor sync point provides a full SCM controlled parallel development and test environment based on the AccuRev SCM, which is fully integrated with the stage map in Endevor. In AccuRev, the developer can work in parallel and on parallel releases, but after promoting to the first stream which will be synchronized to Endevor (the sync point) further moves in Endevor will be done in a sequential order.
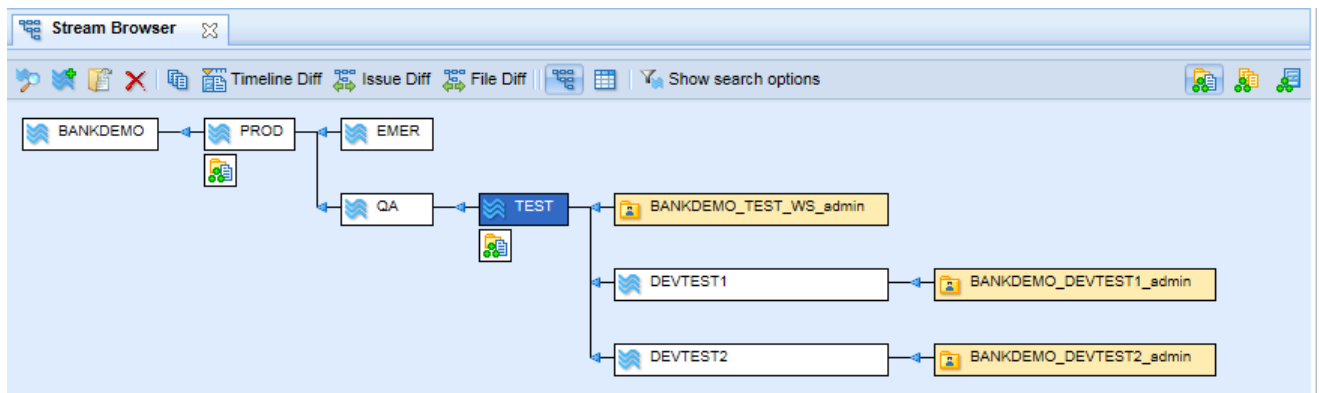
Features

This chapter explains the main features available in Enterprise Developer when the AccuRev repository is synchronized with Endevor.

Enterprise Developer combined with direct access to the AccuRev repository provides the developer with powerful access to all sources of interest, as well as auditing and history information about source changes. Furthermore, comparing and merging any source changes done during the development process is fully supported. These capabilities are fully available for a cross-platform development environment where

- The developer wants to make source changes and debug/test source changes locally.
- The developer wants to promote the source changes into a team test environment on the mainframe in Endevor.
- The next promote steps are done in Endevor up to the production stage.
- The developer needs the ability to support emergency changes from the IDE directly on the mainframe.

The following sections describe main functions available in the standard AWM model for Enterprise Sync. Although you may jump directly to a function of interest, the order of the next chapters is oriented towards the development process:

- Creating an AccuRev workspace on your local machine.
- Linking files and folders to COBOL or PL/I projects.
- Locking files in Endevor (sign-out).
- Editing files which are linked to AccuRev.
- Building, debugging and testing the application in a distributed environment (see *Getting started with Micro Focus Enterprise Developer for Eclipse*).
- Promoting files in AccuRev with synchronization to Endevor.
- Testing the application on the mainframe (the supported integration with standard mainframe debuggers like the IBM Debug Tool for z/OS or Compuware Xpediter are not part of this guide).
- Moving files in Endevor up to the production stage while synchronizing the changes with AccuRev.
- Changing files in Endevor (for example an emergency change) and synchronizing this change to AccuRev.
- Analyzing and Resolving conflicts in AccuRev (for example: emergency change done in parallel to the next release change).
- Resolving conflicts when working on parallel releases.

Loading the AWM Application for Enterprise Sync

1. Start Enterprise Developer and open the **Team Developer** perspective.
2. When expanding the mainframe system entry in the Team Developer tree view, an application with the name `Enterprise Sync V2.1 Endevor Application` should be visible. Select **Load Application** from the context menu.

   Note: The application name might be different in your installation.

In the following sections it is assumed that this AWM application is loaded.

Creating an AccuRev Workspace

A developer needs his own AccuRev workspace which must be associated to an Eclipse project before he can start working on files.

In Enterprise Developer, the following steps must be executed creating a new workspace and associating this workspace with an Eclipse project.

1. In the **Team Developer** Tree view on the AccuRev Workspace entry select **New** > **Project…** from the context menu.

2. In the **New Project** wizard select **AccuRev** > **Project from AccuRev** and click **Next**.

3. Select the AccuRev server address and port (port 5050 is installation default). Then select the AccuRev depot and the gated stream which you want to use as a basis for creating an AccuRev workspace. You may have to login to AccuRev first. Then click Next.

    For the configuration used in this book the stream `ACCUTST1_TEST_GATE` would be the right selection for planning file changes based on the `ACCUTST1_TEST` stream which is mirrored with the Endevor `TEST` stage.

    For emergency changes, the selection of `ACCUTST1_EMER_GATE` would be the right one.

    If the AccuRev workspace already exists but is not connected to an Eclipse project, then select the workspace in this dialog.

4. Enter an unique new AccuRev workspace name. This could be the same name as the parent stream, because AccuRev will add your user name automatically. Specify a path on your disk outside the Eclipse workspace (e.g. `c:\microfocus\esd\`) and then click **Next**.

5. Enter an unique new Eclipse project name and then click **Next**.

6. Create the workspace in a General Eclipse Project. Then click **Next** and then **Finish** on the next dialog to create the AccuRev workspace in a general Eclipse project.

    We recommend selecting a general Eclipse project. This has the advantage to decide later on which AccuRev workspace files or folders you want to add to an Micro Focus Cobol or PL/I project.

    As an alternative you could directly select an Micro Focus project in this dialog. By doing this you would map the complete AccuRev workspace with a Micro Focus project.

7. Refresh the AccuRev Workspace entry in the Team Developer Tree view to see the created Eclipse projects which are associated to an AccuRev workspace.

Navigating to AccuRev Files

1. Expand the AccuRev workspace a few times and navigate to a folder which contains synchronized Endevor elements. By selecting a file, the **Properties** view contains values for the AccuRev and Endevor properties.

    If not self-explanatory, the meaning of the AccuRev and Endevor properties are described in the *Enterprise Sync Installation and Administration Guide*.

Team Devel... ⊠ Project Expl... COBOL Expl... Server Expl...

⊿ 📂 AccuRev Workspace
   ▷ 📁 BANKDEMO_EMER
   ⊿ 📁 BANKDEMO_TEST
      ⊿ 📁 bankdemo BANKDEMO_PROD (backed)
         ▷ 📁 ASM BANKDEMO_PROD (backed)
         ▷ 📁 BMS BANKDEMO_PROD (backed)
         ⊿ 📁 COBOL BANKDEMO_PROD (backed)
            📄 BBANK10P.cbl BANKDEMO_QA (backed)
            📄 BBANK20P.cbl BANKDEMO_TEST (backed)
            📄 BBANK30P.cbl BANKDEMO_TEST (backed)
            📄 BBANK35P.cbl BANKDEMO_PROD (backed)
            📄 BBANK40P.cbl BANKDEMO_PROD (backed)
            📄 BBANK50P.cbl BANKDEMO_PROD (backed)
            📄 BBANK60P.cbl BANKDEMO_PROD (backed)

Properties ⊠   Copybook Depend...   Outline   Program Outline

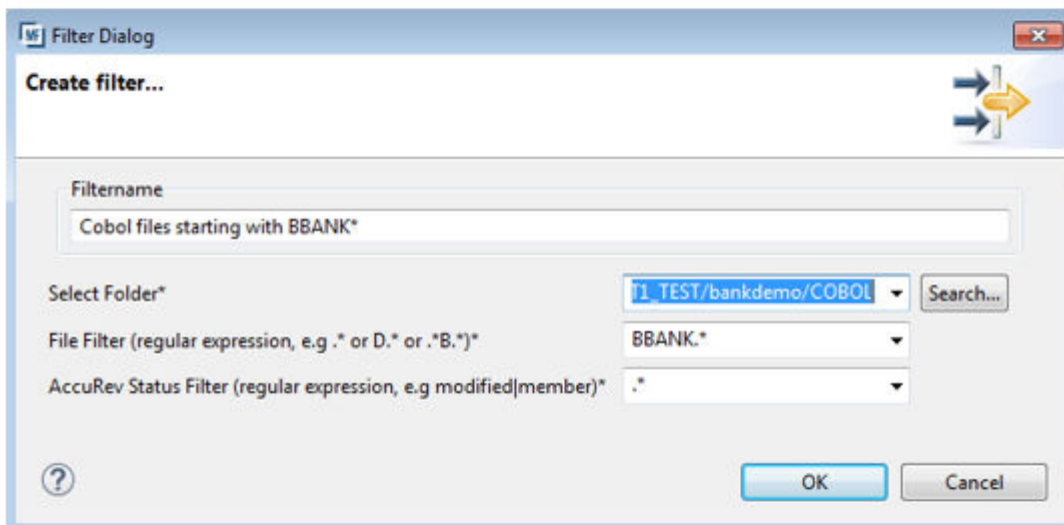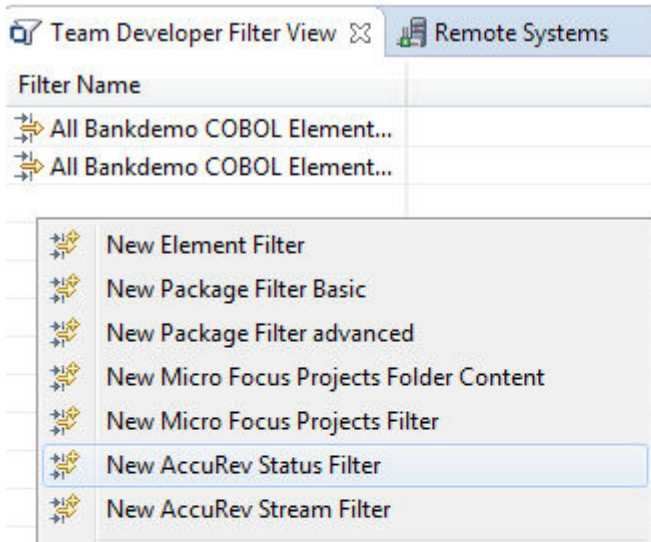| Property	Value
▷ 01 General	
▷ 02 Mapping	
⊿ 03 AccuRev	
034 Element-ID	197
035 Element Type	TEXT
036 Is Project shared with AccuRev	true
037 Pathname	\.\bankdemo\COBOL\BBANK10P.cbl
038 Status	(backed)
039 Stream	BANKDEMO_QA
040 Stream Version	1
041 Version	BANKDEMO_QA\1
⊿ 04 Endevor	
042 Component VVLL	0100
043 Element	BBANK10P
044 Element VVLL	0101
045 Type	COBOL
046 Endevor Environment	SMPLTEST
047 System	MFIUPH
048 Subsystem	BANKDEMO
049 CCID	MFI
050 Comment	MOVE
051 Last Action Date	16/10/08
052 Last Action Name	MOVE
053 Last Action RC	00000

2. On a folder level you can decide to display the folder content in the **Team Developer** Table view. The table view displays Eclipse, AccuRev and Endevor specific columns and Enterprise Developer supports additional functions like column sorting, filter criteria and text search in columns.

CSIMVS_ED23U2, Enterprise Sync V2.1 Endevor Application: COBOL Eclipse resource children

	Name	Suffix	Version	Status	Signout User	Last Modified	Size
	BBANK10P.cbl	cbl	ACCUTST1_PROD\1	(backed)		30.12.16 21:41	20500
	BBANK20P.cbl	cbl	ACCUTST1_PROD\1	(backed)		30.12.16 21:41	33784
	BBANK30P.cbl	cbl	ACCUTST1_PROD\1	(backed)		30.12.16 21:41	40098
	BBANK35P.cbl	cbl	ACCUTST1_PROD\1	(backed)		30.12.16 21:41	28946
	BBANK40P.cbl	cbl	ACCUTST1_PROD\1	(backed)		30.12.16 21:41	30094
	BBANK50P.cbl	cbl	ACCUTST1_PROD\1	(backed)		30.12.16 21:41	45510
	BBANK60P.cbl	cbl	ACCUTST1_PROD\1	(backed)		30.12.16 21:41	34440
	BBANK70P.cbl	cbl	ACCUTST1_PROD\1	(backed)		30.12.16 21:41	37802
	BBANK80P.cbl	cbl	ACCUTST1_PROD\1	(backed)		30.12.16 21:41	26486
	BBANK90P.cbl	cbl	ACCUTST1_PROD\1	(backed)		30.12.16 21:41	20828

3. When selecting a file the **Team** context menu supports the required AccuRev functions.

4. The **Team Developer Filter View** can be used to filter files in the AccuRev workspace.

Team Developer Filter View ⊠   Remote Systems

Filter Name

⤇ All Bankdemo COBOL Element...
⤇ All Bankdemo COBOL Element...

⤇	New Element Filter
⤇	New Package Filter Basic
⤇	New Package Filter advanced
⤇	New Micro Focus Projects Folder Content
⤇	New Micro Focus Projects Filter
⤇	New AccuRev Status Filter
⤇	New AccuRev Stream Filter

Filter Dialog

Create filter...

Filtername

Cobol files starting with BBANK*

Select Folder*   T1_TEST/bankdemo/COBOL ▾   Search...

File Filter (regular expression, e.g .* or D.* or .*B.*)*   BBANK.*   ▾

AccuRev Status Filter (regular expression, e.g modified|member)*   .*   ▾

(?)   OK   Cancel

Team Developer Table View ⊠   Team Developer Error List   Team Developer Job View   File Mappings

CSIMVS_ED23U2, Enterprise Sync V2.1 Endevor Application: Filter 'Cobol files starting with BBANK*'

	Name	Suffix	Version	Status	Signout ...	Last Modified	Size
	BBANK10P.cbl	cbl	ACCUTST...	(backed)		30.12.16 21:41	20500
	BBANK20P.cbl	cbl	ACCUTST...	(backed)		30.12.16 21:41	33784
	BBANK30P.cbl	cbl	ACCUTST...	(backed)		30.12.16 21:41	40098
	BBANK35P.cbl	cbl	ACCUTST...	(backed)		30.12.16 21:41	28946
	BBANK40P.cbl	cbl	ACCUTST...	(backed)		30.12.16 21:41	30094
	BBANK50P.cbl	cbl	ACCUTST...	(backed)		30.12.16 21:41	45510
	BBANK60P.cbl	cbl	ACCUTST...	(backed)		30.12.16 21:41	34440
	BBANK70P.cbl	cbl	ACCUTST...	(backed)		30.12.16 21:41	37802
	BBANK80P.cbl	cbl	ACCUTST...	(backed)		30.12.16 21:41	26486
	BBANK90P.cbl	cbl	ACCUTST...	(backed)		30.12.16 21:41	20828
	BBANK99P.cbl	cbl	ACCUTST...	(backed)		30.12.16 21:41	8118
	BBANKZZP.cbl	cbl	ACCUTST...	(backed)		30.12.16 21:41	40918

Linking AccuRev Files to Micro Focus COBOL or PL/I Projects

In this guide it is assumed that you are familiar creating Micro Focus mainframe projects in Enterprise Developer. See *Getting started with Micro Focus Enterprise Developer for Eclipse* on how to define and configure such projects.

The AWM application for Enterprise Sync contains an entry `Enterprise Development Projects` which lists all existing Micro Focus COBOL and PL/I projects.
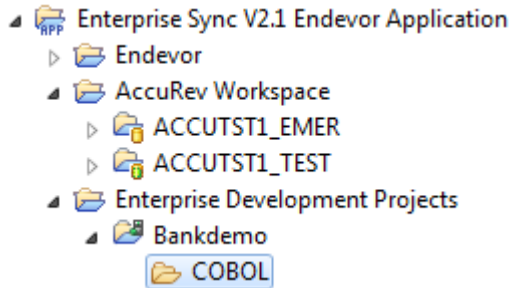
Link the required components from the AccuRev workspace into this project:

1. Link the required COBOL copybook folder from your AccuRev workspace into the Micro Focus COBOL project using **New** > **Project** > **Link Folder to Project** from the context menu.
2. Select the COBOL project. When navigating to the COBOL project, you will see the linked copybook folder in the project structure.
3. Link the required COBOL files from your AccuRev workspace into the Micro Focus COBOL project using **New** > **Project** > **Link File to Folder** from the context menu.
4. Select the appropriate folder within the COBOL project. When navigating to the COBOL project you will see the linked COBOL file in the project structure.

   💡 **Tip:** Using `Drag+Drop` by holding the `Control` key is an alternative linking files or folders. It's possible to select several files at once.

5. You may have to adapt the build path and the compiler directives to assure that the linked files are compiled correctly:
   a) Select **Properties** from the **Cobol projects** context menu.
   b) Select **Determine Directives** from the **Files** context menu.
   c) If all required dependencies are linked and the directives a defined correctly, then the projects build should run as expected.

```
Console ✕                                                    ✖

Micro Focus Build: Bankdemo
[cobollink]    Creating library BBANK50P.lib and object BBANK50P.exp
[cobollink] Microsoft (R) Manifest Tool version 6.2.9200.20789
[cobollink] Copyright (c) Microsoft Corporation 2012.
[cobollink] All rights reserved.
[cobollink] Link complete with no errors
[cobollink]

cobol.cfg.BANKDEMO:

nature.specific.build.cfg.BANKDEMO:

post.build.cfg.BANKDEMO:

combinedbuild.cfg.BANKDEMO:

BUILD SUCCESSFUL
Build finished with no errors.

Total time: 0 seconds
```

Locking Endevor Elements

Before editing a file linked to the AccuRev workspace it might make sense to lock this file on the mainframe first to let users know that this file is in work. It's usual in Endevor to lock a file before changing it. The corresponding Endevor action is `Sign-Out`.

The `Sign-Out` function is available on the context menu of a file selected either in an Endevor view or in the AccuRev workspace or in a COBOL or PL/I project.
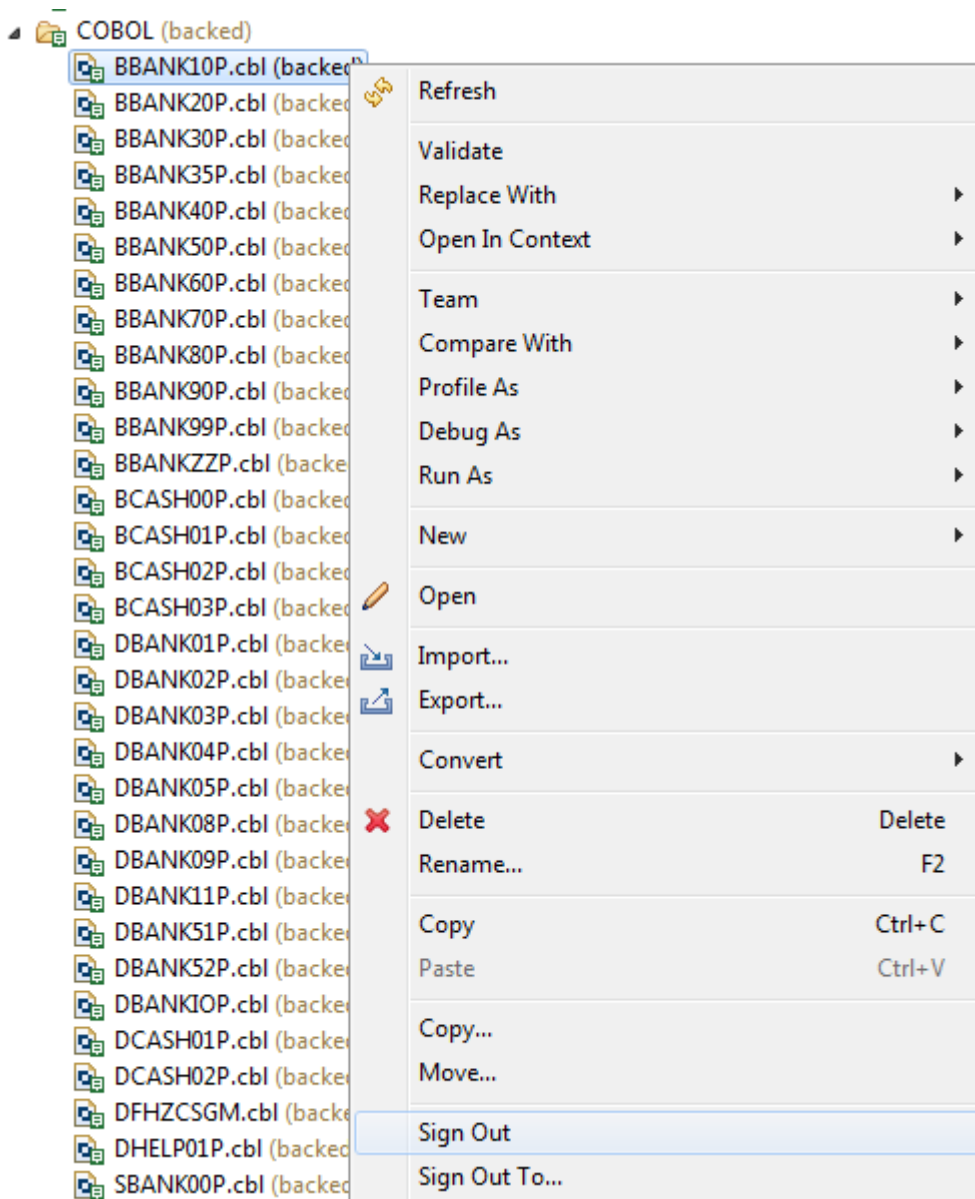
> ✏️ **Note:** When Enterprise Sync synchronizes files from Endevor to AccuRev it does not sign-out the Endevor files. Therefore a developer has to do this explicitly, if required. But a developer is not forced to sign-out a file in Endevor when starting his work in his AccuRev workspace.

If a developer doesn't sign-out the file, the synchronization process will sign-out the file in Endevor directly before the synchronization to Endevor is executed. If this sign-out fails because the file is signed-out to another user, then the synchronization request is rejected.

If a Sign-out on an Endevor file has been set, this information is not directly visible in AccuRev. It depends on the configured synchronization time interval. The next iteration will synchronize the changed Endevor file's attribute and then the **Properties** view will show the updated information.

Editing Files in COBOL or PL/I Projects Linked to AccuRev

1. Before editing a file, a user may want to check the current status of the file in AccuRev. By doing this he has also access to the Endevor information. When selecting a file in the AccuRev workspace or

selecting a linked AccuRev workspace file in a COBOL or PL/I project, the **Properties** view shows all AccuRev and Endevor attributes of interest.

Property	Value
▷ 01 General	
▷ 02 Mapping	
▲ 03 AccuRev	
034 Element-ID	967
035 Element Type	PTEXT
036 Is Project shared with AccuRev	true
037 Pathname	\.\bankdemo\COBOL\BBANK50P.cbl
038 Status	(backed)
039 Stream	ACCUTST1_PROD
040 Stream Version	1
041 Version	ACCUTST1_PROD\1
▲ 04 Endevor	
042 Component VVLL	0105
043 Element	BBANK50P
044 Element VVLL	0100
045 Type	COBOL
046 Endevor Environment	SMPLPROD
047 System	ACCUTST1
048 Subsystem	BANKDEMO
049 CCID	MFI
050 Comment	INITIALIZE SANDBOX
051 Last Action Date	17/01/02
052 Last Action Name	SIGNIN
053 Last Action RC	00000
054 Last Action Time	04:51:19
055 Last Action User	MFIJKH
056 Processor Group	CICS
057 Signout User	MFIUPH
058 Stage ID	P
059 Stage Name	PROD
060 Stage Number	2

The tree view label directly displays the status in AccuRev. In the sample above the **Properties** view shows that the file is currently only available in the production stage and it has been already signed-out in Endevor.

2. Although the developer could edit the file directly in the AccuRev workspace, it makes sense to link the file into a Micro Focus COBOL or PL/I project to get the full Enterprise Developer editor, build and debugging support. See *Linking AccuRev Files into Micro Focus COBOL or PL/I Projects*. Opening the editor from the COBOL project context provides access to the dependent copybooks, program structure, content assist, error markers etc.
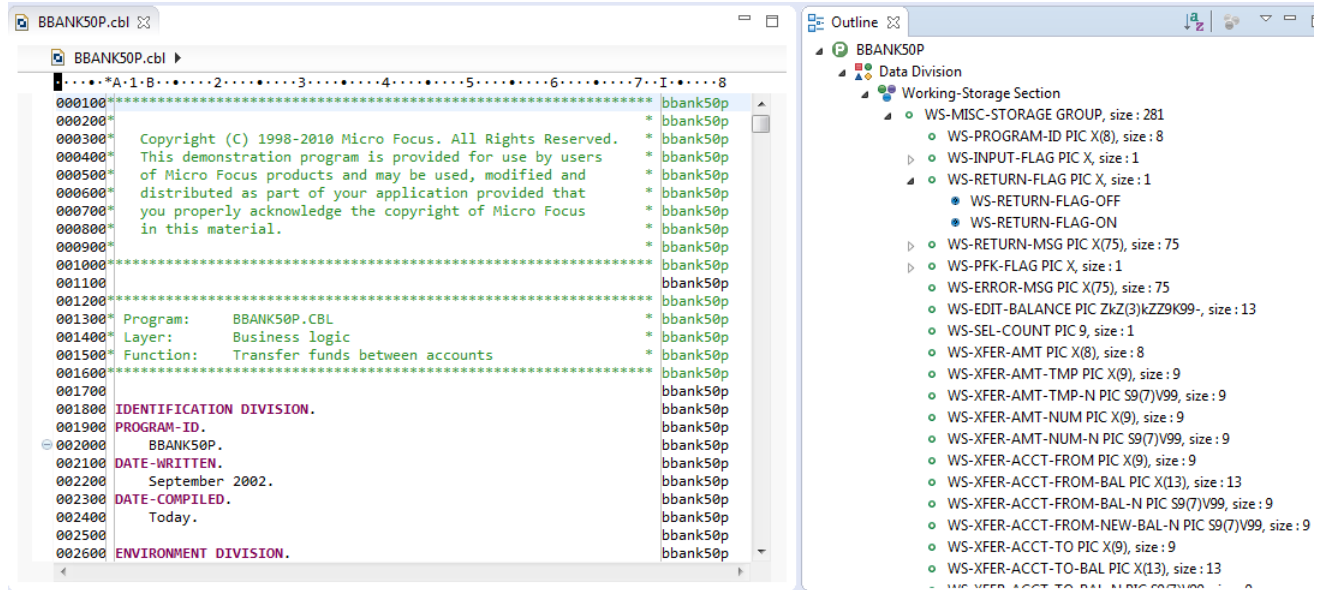
3. Saving and closing the file builds the executable module.

4. The status of the file changes to `(modified)`.

This status is visible in all views which are referencing this AccuRev workspace entry, for example in Team Developer Table view.

Name	Suffix	Version	Status	Signout User	Last Modified
BBANK10P.cbl	cbl	ACCUTST1_PROD\1	(backed)		30.12.16 21:41
BBANK20P.cbl	cbl	ACCUTST1_PROD\1	(backed)		30.12.16 21:41
BBANK30P.cbl	cbl	ACCUTST1_PROD\1	(backed)		30.12.16 21:41
BBANK35P.cbl	cbl	ACCUTST1_PROD\1	(backed)		30.12.16 21:41
BBANK40P.cbl	cbl	ACCUTST1_PROD\1	(backed)		30.12.16 21:41
BBANK50P.cbl	cbl	ACCUTST1_TEST\1	(modified)	MFIUPH	02.01.17 11:19
BBANK60P.cbl	cbl	ACCUTST1_PROD\1	(backed)		30.12.16 21:41

# Promoting Files in AccuRev with Synchronization to Endevor

1. To promote a file from the AccuRev Workspace to a gated stream which triggers an on-demand synchronization to Endevor, either select **Team**/**Promote** from the context menu of selected AccuRev

workspace files, or use the toolbar promote icon from selected Micro Focus COBOL or PL/I project files linked to AccuRev.

Note: The AccuRev team context menu is not available when selecting resources which are linked to AccuRev, like in Micro Focus COBOL or PL/1 projects. But the AccuRev toolbar icons are available on those linked resources supporting the most important AccuRev functions directly when working in the project context.

2. This promote function requires the developer's mainframe and AccuRev credentials. The user is asked only once per Enterprise Developer session for the mainframe credentials and only once per Enterprise Sync session for the AccuRev credentials. Thus, a credentials dialog may pop up, if the first promote is called.

3. On the promote dialog specify an Endevor CCID and a Comment used for AccuRev and Endevor and pass Endevor processing options, e.g. whether to generate the selected Endevor elements or to override existing sign-outs. For each element in the list it is possible to change the Endevor Processor Group.
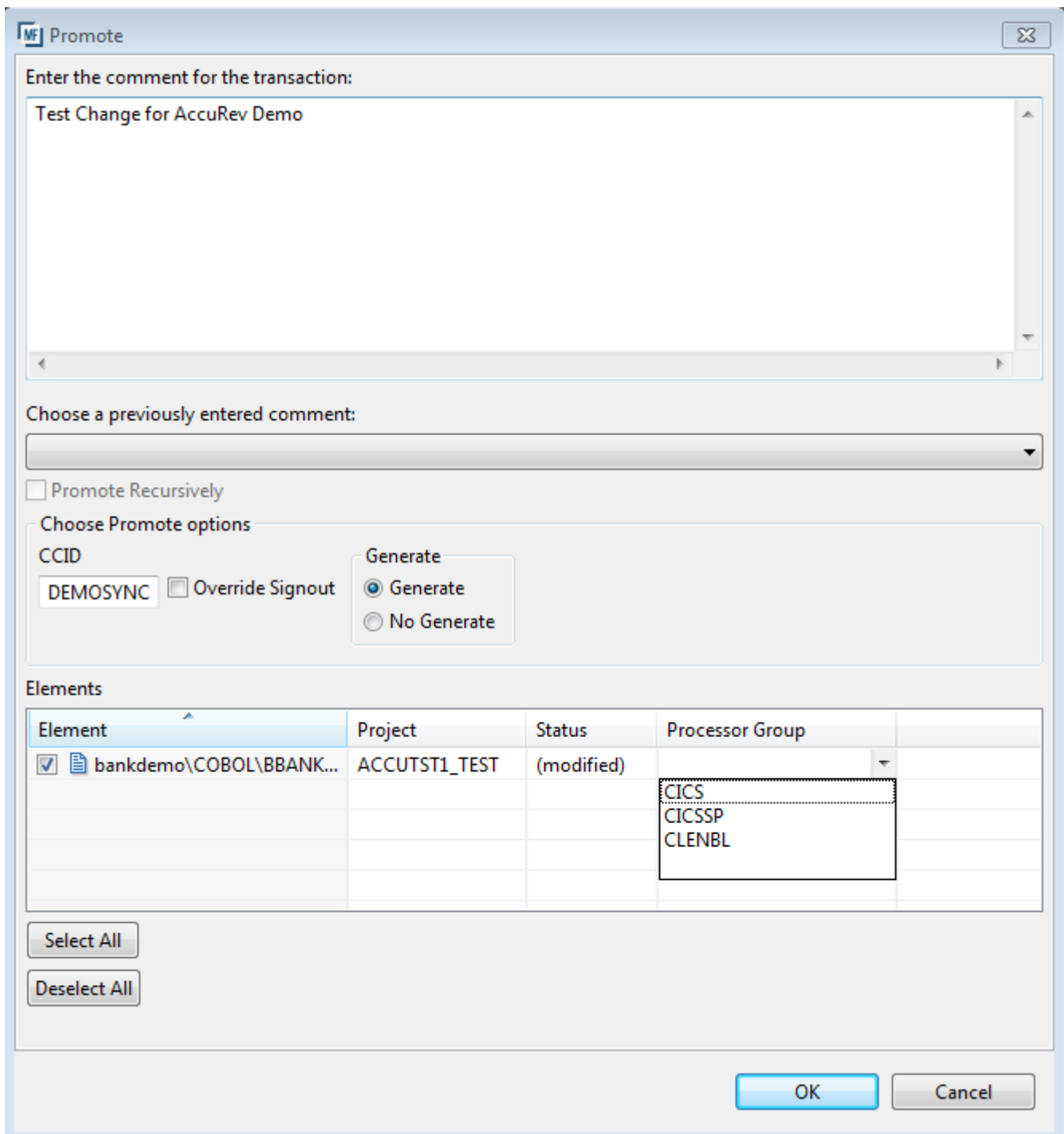
> Note: At any time before promoting, the developer could use the AccuRev `Keep` action to save his changes in the AccuRev depot on the server. This means that his changes are managed centrally by AccuRev.

4. Before executing the `Promote` function, the **Team Developer Tree view** has displayed decorators showing that there are modified files in the workspace. The synchronization is executed on demand on the server side. The file status changes directly to `(backed)` and the **Properties** view shows that the file has been promoted to the gated stream.

> Note: The Enterprise Developer IDE is not blocked during the running synchronization.

If an on demand synchronization has been executed successfully, Enterprise Developer displays the storage decorator on the AccuRev workspace icon with a green background, otherwise, it will display with a red background and a popup message is displayed containing the Endevor error message and the Endevor message text. For example, if the promoted file was already signed-out to another user and override sign-out wasn't specified on the promote dialog the following error message would be displayed:
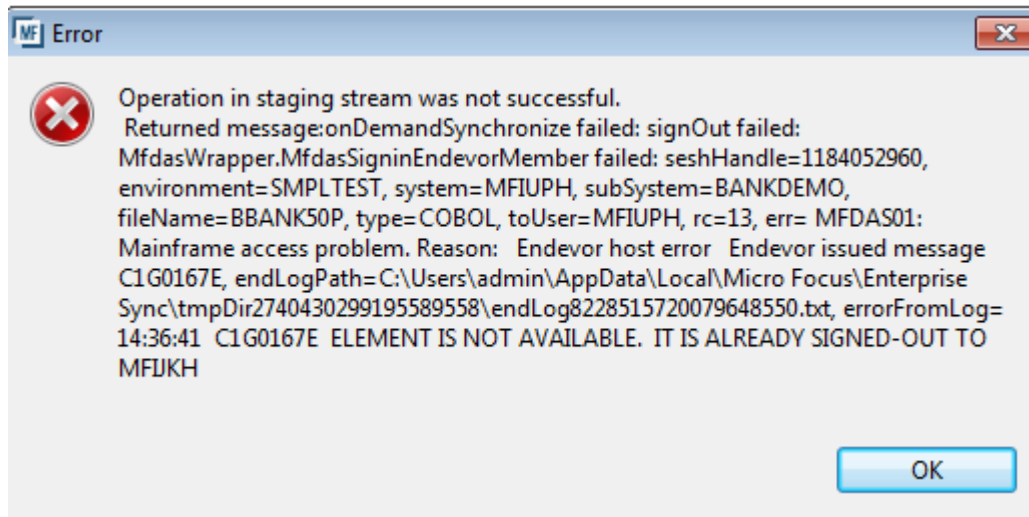
Navigating to Endevor Elements

Enterprise Developer provides full access to Endevor on the mainframe. There are several ways navigating to Endevor elements.

1. The Team Developer Tree view supports a step by step navigation to the elements starting on the environment level. Expand the Endevor entry several times until the element level is displayed:
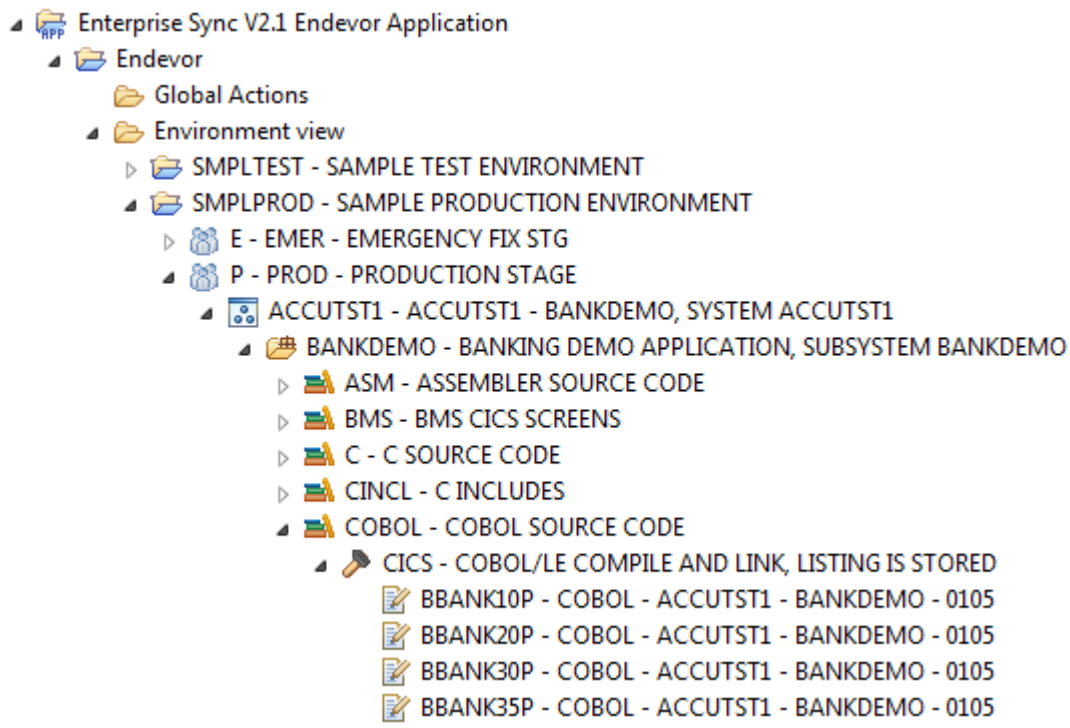
Note: An element list retrieved from the tree view displays elements existing in the selected stage only. This view does not support stage concatenation.

2. Endevor users usually prefer table views and using filter criteria to create the elements of interest in a table view. This is supported in Enterprise Developer as well. In the **Team Developer Filter view**, define a new element filter by specifying search and display criteria:
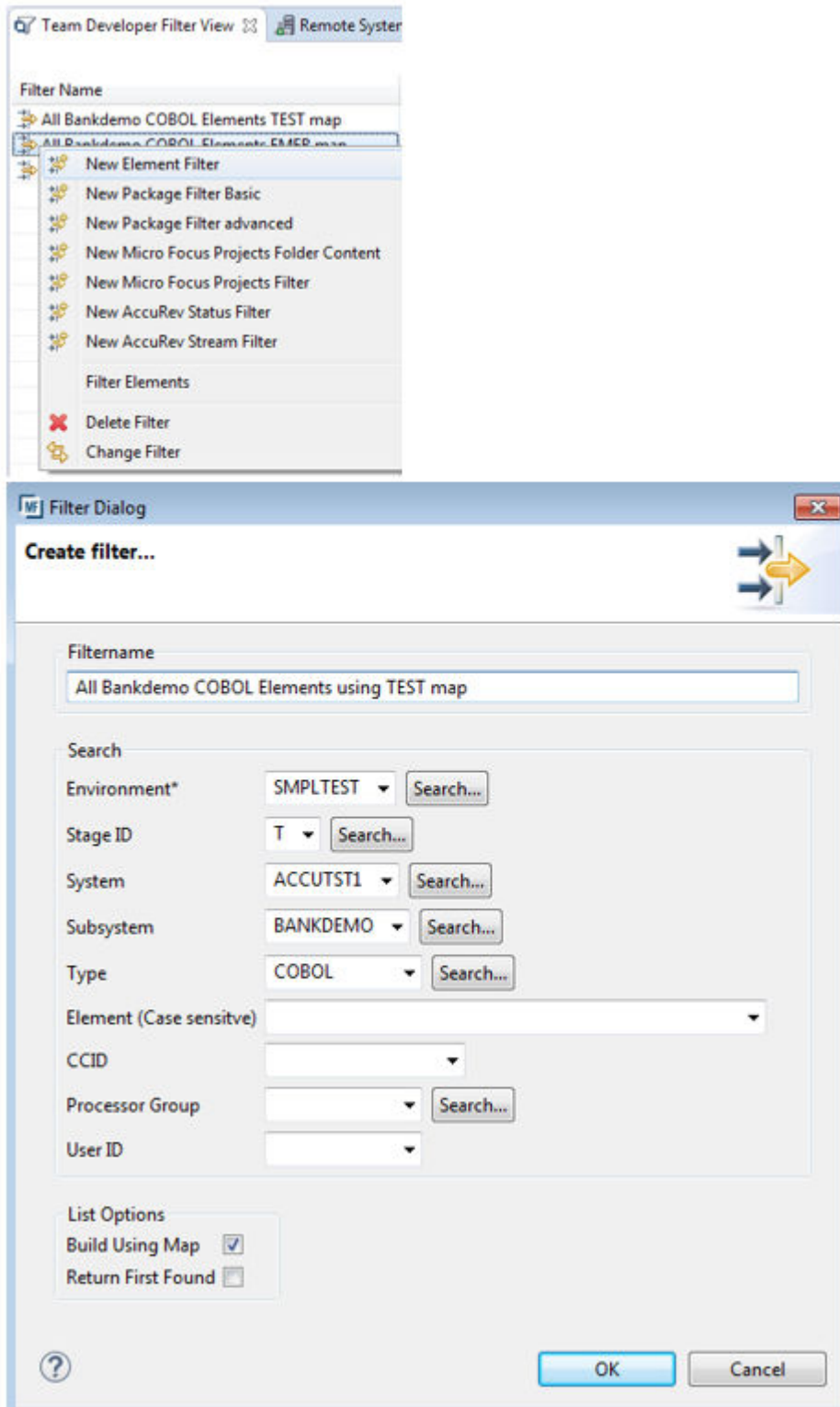
3. Saving this filter with **OK** and double-clicking on the filter entry displays the result in the **Team Developer Table View**. The example list displayed below lists `BBANK50P` twice, which is existing in stage `TEST` and `PROD`, because the flag **Build Using Map** was set but not `Return First Found`.

4. The Endevor element's context menu in the tree or table view supports all Endevor commands which can be executed on elements.

Verifying Endevor Compile Results

If the synchronization process from AccuRev to Endevor has been triggered with the `Generate` option and the Endevor generate fails after the synchronization, then a message is displayed in Enterprise Developer which informs the user about the generate error. The synchronization itself has been executed successfully.

1. The user could now navigate to the element using the Endevor view and select the **Browse Listing** action from the context menu which opens the compiler listing, assuming that compiler listings are managed in Endevor.

2. If configured by the Endevor administrator, the context menu function **Display Generate Errors** displays the compiler messages directly in the **Team Developer Error List view**.
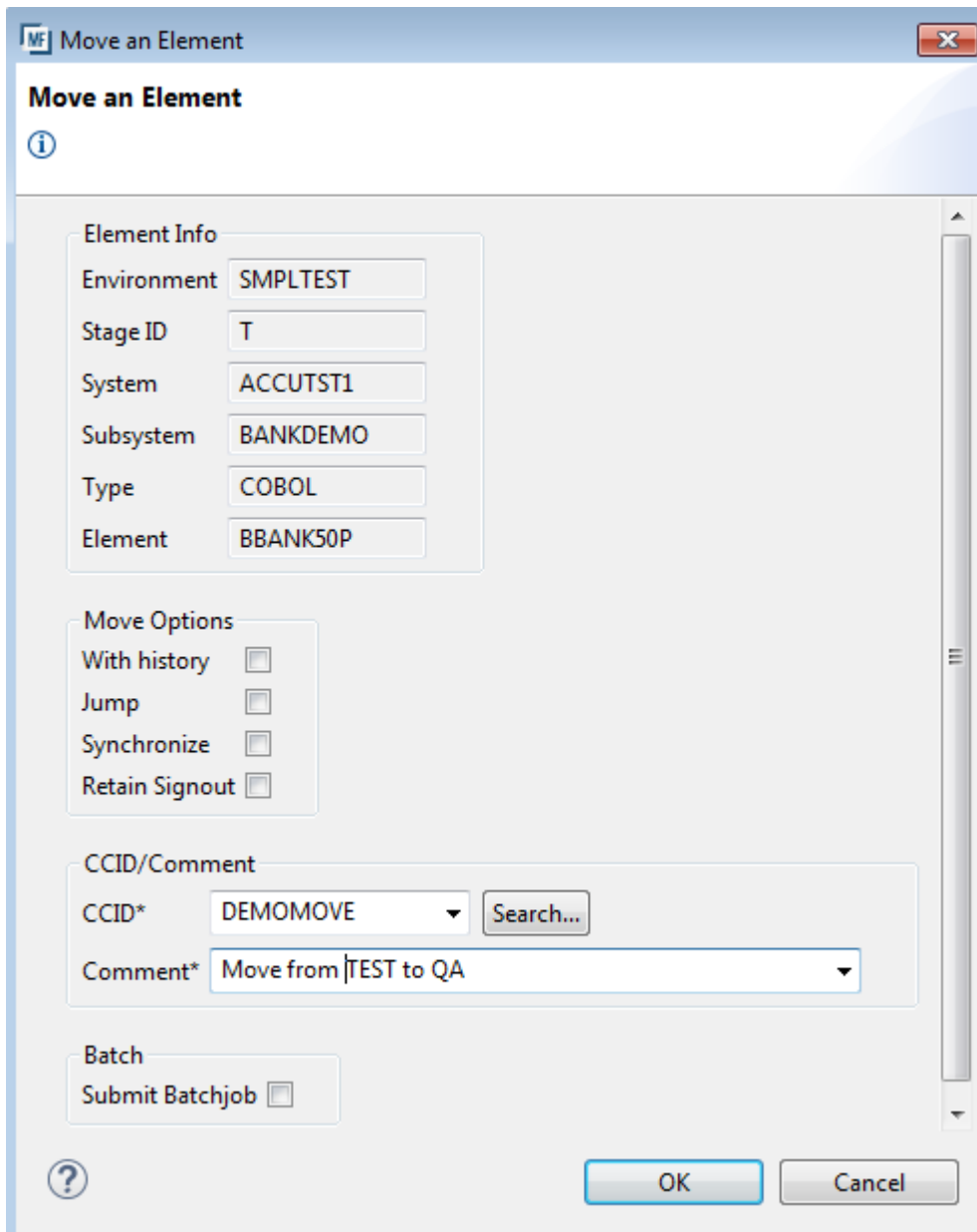
Moving Files in Endevor and Synchronizing to AccuRev

1. To `Move` an Endevor element to the next stage, navigate to an Endevor element and select **Actions** > **Move** from the context menu.

Note: Several elements could be moved together to the next stage. Either use **Mass Actions** > **Move** from the context menu or add `Move` commands to an Endevor change package and execute this package.

2. On the **Move** dialog enter a **CCID**, a **Comment** and select additional optional **Move options** and then click **OK**.

3. A pop-up dialog window displays the main **Move** results. A more detailed protocol is opened in the editor as well and the entry in the table view has the new property values associated automatically.

Tool Messages

ⓘ TSUIN0089 The following tool messages were returned during the action:

NDV_TOOL_ISPF_REX_MoveElementOnline: ⓘ

```
09:42:21 C1G0202I ACTION #1 / STMT #1
09:42:21 C1G0203I MOVE ELEMENT BBANK50P
09:42:21 C1G0204I FROM ENVIRONMENT: SMPLTEST SYSTEM: ACCUTST1 SUBSYSTEM: BANKDEMO TYPE: COBOL STAGE ID
09:42:21 C1G0232I OPTIONS: SIGNIN
09:42:21 C1G0232I CCID: DEMOMOVE
09:42:21 C1G0232I COMMENT: MOVE FROM TEST TO QA
09:42:22 SMGR122W NO ELEMENT SOURCE CHANGES DETECTED
09:42:22 C1G0143I BEGINNING EXECUTION OF MOVE PROCESSOR MFMLOD01 OF GROUP CICS.
09:42:24 C1G0144I PROCESSOR MFMLOD01 EXECUTION COMPLETED, HIGHEST PROCESSOR STEP RC WAS 0000
09:42:24 C1G0143I BEGINNING EXECUTION OF DELETE PROCESSOR MFDLOD01 OF GROUP CICS.
09:42:24 C1G0144I PROCESSOR MFDLOD01 EXECUTION COMPLETED, HIGHEST PROCESSOR STEP RC WAS 0000
09:42:25 C1G0200I ELEMENT ACTION REQUEST PROCESSING COMPLETED, HIGHEST ENDEVOR RC WAS 0004
```

ⓘ   OK   Cancel

4. The changes done by the Endevor `Move` command are synchronized to AccuRev. This could lead to a status change in AccuRev. Use **Team** > **Refresh** > **Selected Projects** from the context menu making sure that the all status information is up-to-date.

Changing Files in Endevor and Synchronizing to AccuRev

Enterprise Developer supports a Remote Edit action allowing the user to retrieve an element from Endevor, open it in the Eclipse based Editor and adding the element directly back into the Endevor repository when saving the file in the editor.

1. Navigate to an Endevor element and select **Remote Edit** from the context menu to save the file in another Endevor environment or to change the system/subsystem association. Otherwise, use **Remote Edit in Place** which will save the element in the same environment's stage 1.
2. For **Remote Edit in Place**, enter a **CCID** and **Comment** and optional select the options how to process the element in Endevor when saved.

The **Remote Edit** dialog contains the following additional fields:

3. After editing this file, save and close the editor.

4. The Properties view or the table view display the changed values. In this example a new element has been added to the EMER stage because the file was edited directly from the PROD stage.

BBANK50P	COBOL	CICS	SMPLPROD	E	ACCUTST1	BANKD...	TESTSYNC
BBANK50P	COBOL	CICS	SMPLPROD	P	ACCUTST1	BANKD...	DEMOMOVE

5. This change will be synchronized to AccuRev with the next running iteration. As long as an AccuRev user is not working based on the corresponding stream hierarchy, this change would not directly have an impact on his work. For an Endevor change in stage EMER, the AccuRev workspace file based on the

TEST stream is still in `(backed)` status. However, the workspace file based on the `EMER` stream is in `(stale)` status.

▲ 📁 AccuRev Workspace
    ▲ 📁 ACCUTST1_EMER
        ▲ 📁 bankdemo (backed)
            ▷ 📁 ASM (backed)
            ▷ 📁 BMS (backed)
            ▲ 📁 COBOL (backed)
                📄 BBANK10P.cbl (backed)
                📄 BBANK20P.cbl (backed)
                📄 BBANK30P.cbl (backed)
                📄 BBANK35P.cbl (backed)
                📄 BBANK40P.cbl (backed)
                📄 BBANK50P.cbl (backed)(stale)
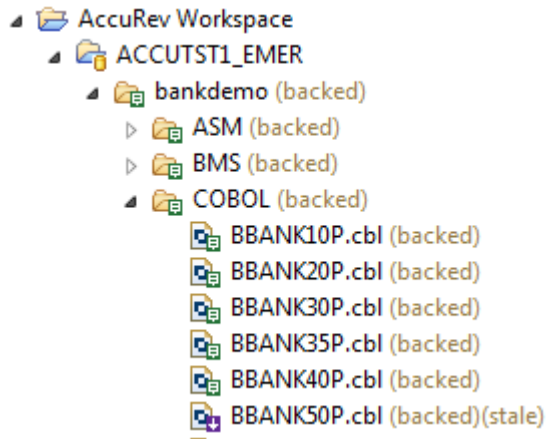
Accepting Incoming Changes

Your local workspace might contain outdated files caused by synchronized changes from Endevor to AccuRev, or by changes promoted in AccuRev by other users. There are several ways how Enterprise Developer supports updating the AccuRev workspace with changes done in the stream hierarchy.

1. The **Team Developer Tree** and **Table view** displays the AccuRev status. Use **Team** > **Refresh** > **Selected Projects** from the context menu making sure that the all status information is up-to-date. The `(stale)` status is displayed if a workspace file needs to be updated by a newer file version available in the stream hierarchy. Use the **Update AccuRev Workspace** toolbar icon or **Team** > **Update AccuRev Workspace** > **Entire Workspace** from the context menu to update the workspace.

2. Or, use the **Synchronize with AccuRev Repository** toolbar icon or **Team** > **Synchronize with AccuRev Repository** from the context menu to open the **Synchronize** view and manage the incoming changes in this view.

3. After Updating the Workspace (⚡) and refreshing the project once again, the **Team Developer** views do not show files in `(stale)` status anymore and the **Synchronize** view should not display incoming changes.

Resolving Conflicts in AccuRev

Caused by synchronized changes from Endevor to AccuRev or by changes promoted in AccuRev by other users, your local workspace might contain changed files which are now in conflict with changes promoted to a parent stream. There are several ways how Enterprise Developer supports analyzing and resolving such conflicts.

1. The **Team Developer Tree** and **Table view** displays the AccuRev status. Use **Team** > **Refresh** > **Selected Projects** from the context menu making sure that the all status information is up-to-date. The overlap status should be displayed if workspace files are in conflict with parent stream files.

2. Or, use the **Synchronize with AccuRev Repository** toolbar icon or **Team** > **Synchronize with AccuRev Repository** from the context menu to open the **Synchronize** view and manage the conflicting files in this view.

3. To analyze who has done which changes, use **TeamVersion Browser** to get a graphical overview of changes.
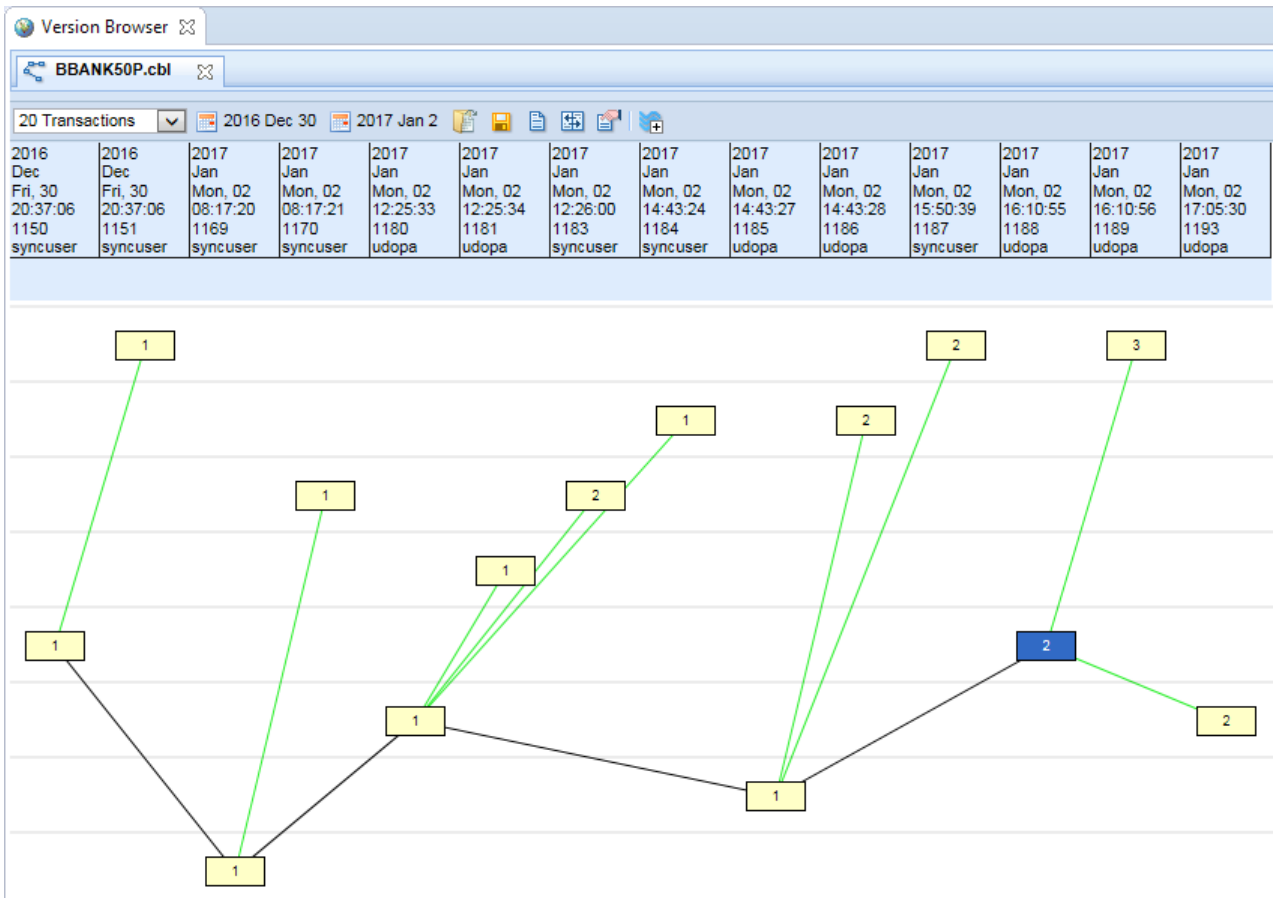
4. Either from the **Version Browser** or from the context menu, you can use the `Annotate` action and easily see who has done which change within a file version.

```
2016 Dec 30 20:37:06    1150    syncuser    47    004600    05  WS-SEL-COUNT                              PIC 9(1).
2016 Dec 30 20:37:06    1150    syncuser    48    004700    05  WS-XFER-AMT                               PIC X(8).
2016 Dec 30 20:37:06    1150    syncuser    49    004800    05  WS-XFER-AMT-TMP                           PIC X(9).
2016 Dec 30 20:37:06    1150    syncuser    50    004900    05  WS-XFER-AMT-TMP-N REDEFINES WS-XFER-AMT-TMP
2016 Dec 30 20:37:06    1150    syncuser    51    005000                                                 PIC S9(7)V99.
2016 Dec 30 20:37:06    1150    syncuser    52    005100    05  WS-XFER-AMT-NUM                           PIC X(9).
2016 Dec 30 20:37:06    1150    syncuser    53    005200    05  WS-XFER-AMT-NUM-N REDEFINES WS-XFER-AMT-NUM
2016 Dec 30 20:37:06    1150    syncuser    54    005300                                                 PIC S9(7)V99.
2016 Dec 30 20:37:06    1150    syncuser    55    005400    05  WS-XFER-ACCT-FROM                         PIC X(9).
2016 Dec 30 20:37:06    1150    syncuser    56    005500    05  WS-XFER-ACCT-FROM-BAL                     PIC X(13).
2016 Dec 30 20:37:06    1150    syncuser    57    005600    05  WS-XFER-ACCT-FROM-BAL-N                   PIC S9(7)V99.
2016 Dec 30 20:37:06    1150    syncuser    58    005700    05  WS-XFER-ACCT-FROM-NEW-BAL-N               PIC S9(7)V99.
2016 Dec 30 20:37:06    1150    syncuser    59    005800    05  WS-XFER-ACCT-TO                           PIC X(9).
2016 Dec 30 20:37:06    1150    syncuser    60    005900    05  WS-XFER-ACCT-TO-BAL                       PIC X(13).
2016 Dec 30 20:37:06    1150    syncuser    61    006000    05  WS-XFER-ACCT-TO-BAL-N                     PIC S9(7)V99.
2017 Jan 2 14:43:27     1185    udopa       62    006100    05  WS-XFER-ACCT-TO-NEW-BAL-N                 PIC S9(7)V99.
2016 Dec 30 20:37:06    1150    syncuser    63    006200
2016 Dec 30 20:37:06    1150    syncuser    64    006300 01  WS-BANK-DATA.
2016 Dec 30 20:37:06    1150    syncuser    65    006400 COPY CBANKDAT.
```

5. In the **Version Browser**, you could switch to the **History** view or from the context menu you could use the **Team** > **Show AccuRev History** action and easily see when changes were applied to AccuRev.

| Team Developer Table View | Team Developer Error List | Team Developer Job View | File Mappings | History ⊠ |

Element History - BBANK50P.cbl

#	Action	Time	Virtual Version	User	Comment
1194	keep	02.01.2017 17:06:34	accWsNDV2ACCACCUTST1_PRODs...	udopa	MOVE FROM EMER TO PROD/bcTransactionType:APPLY
1195	promote	02.01.2017 17:06:34	ACCUTST1_PROD/5	udopa	MOVE FROM EMER TO PROD/bcTransactionType:APPLY
1193	co	02.01.2017 17:05:30	ACCUTST1_TEST_GATE_udopa/2	udopa	
1192	promote	02.01.2017 17:00:40	ACCUTST1_PROD/4	syncuser	promoting bankdemo/COBOL/BBANK50P.cbl from ACCU...
1190	keep	02.01.2017 16:10:59	accWsNDV2ACCACCUTST1_EMERsy...	udopa	CHANGE IN STAGE EMER/bcTransactionType:APPLY
1191	promote	02.01.2017 16:10:59	ACCUTST1_EMER/1	udopa	CHANGE IN STAGE EMER/bcTransactionType:APPLY
1189	promote	02.01.2017 16:10:56	ACCUTST1_PROD/3	udopa	MOVE FROM QA TO PROD/bcTransactionType:APPLY
1188	keep	02.01.2017 16:10:55	accWsNDV2ACCACCUTST1_PRODs...	udopa	MOVE FROM QA TO PROD/bcTransactionType:APPLY
1187	promote	02.01.2017 15:50:39	ACCUTST1_PROD/2	syncuser	promoting bankdemo/COBOL/BBANK50P.cbl from ACCU...
1186	promote	02.01.2017 14:43:28	ACCUTST1_QA/2	udopa	MOVE FROM TEST TO QA/bcTransactionType:APPLY

6. The support for comparing file versions is available in many places. For example, navigate to an AccuRev workspace file and select **Compare With** > **AccuRev Revision** from the context menu.

7. Then select the revision from the **History** list and a **Text Compare** window shows both files in compare mode.

File History: BBANK50P.cbl ⊠

File History: BBANK50P.cbl

#	Action	Time	Virtual Ve...	User	Comment
1195	pro...	02.01.2017 17:06...	ACCUTS...	udopa	MOVE FROM EMER TO PROD/bcTransactionType...
1194	keep	02.01.2017 17:06...	accWsN...	udopa	MOVE FROM EMER TO PROD/bcTransactionType...
1193	co	02.01.2017 17:05...	ACCUTS...	udopa	
1192	pro...	02.01.2017 17:00...	ACCUTS...	sync...	promoting bankdemo/COBOL/BBANK50P.cbl fro...
1191	pro...	02.01.2017 16:10...	ACCUTS...	udopa	CHANGE IN STAGE EMER/bcTransactionType:AP...
1190	keep	02.01.2017 16:10...	accWsN...	udopa	CHANGE IN STAGE EMER/bcTransactionType:AP...
1189	pro...	02.01.2017 16:10...	ACCUTS...	udopa	MOVE FROM QA TO PROD/bcTransactionType:A...
1188	keep	02.01.2017 16:10...	accWsN...	udopa	MOVE FROM QA TO PROD/bcTransactionType:A...

Text Compare

Present File: BBANK50P.cbl

```
001400* Layer:        Business logic
001500* Function:     Transfer funds between accounts
001600*****************************************
          * Change done in AccuRev TEST workspace
001700
001800 IDENTIFICATION DIVISION.
001900 PROGRAM-ID.
002000     BBANK50P.
002100 DATE-WRITTEN.
```

Repository file: BBANK50P.cbl

```
001400* Layer:        Business logic
001500* Function:     Transfer funds between acco
001600*****************************************
          * Emergeny change
          * 2. Emergency change
001700
001800 IDENTIFICATION DIVISION.
001900 PROGRAM-ID.
002000     BBANK50P.
```

8. For conflicting files, the `Promote` action is disabled and the `Merge` action has to be used first to resolve the conflict. This action is also available on the toolbar .

9. Click **Team** > **Merge** to open the **AccuRev Diff** Editor which easily supports merging to different AccuRev file versions.
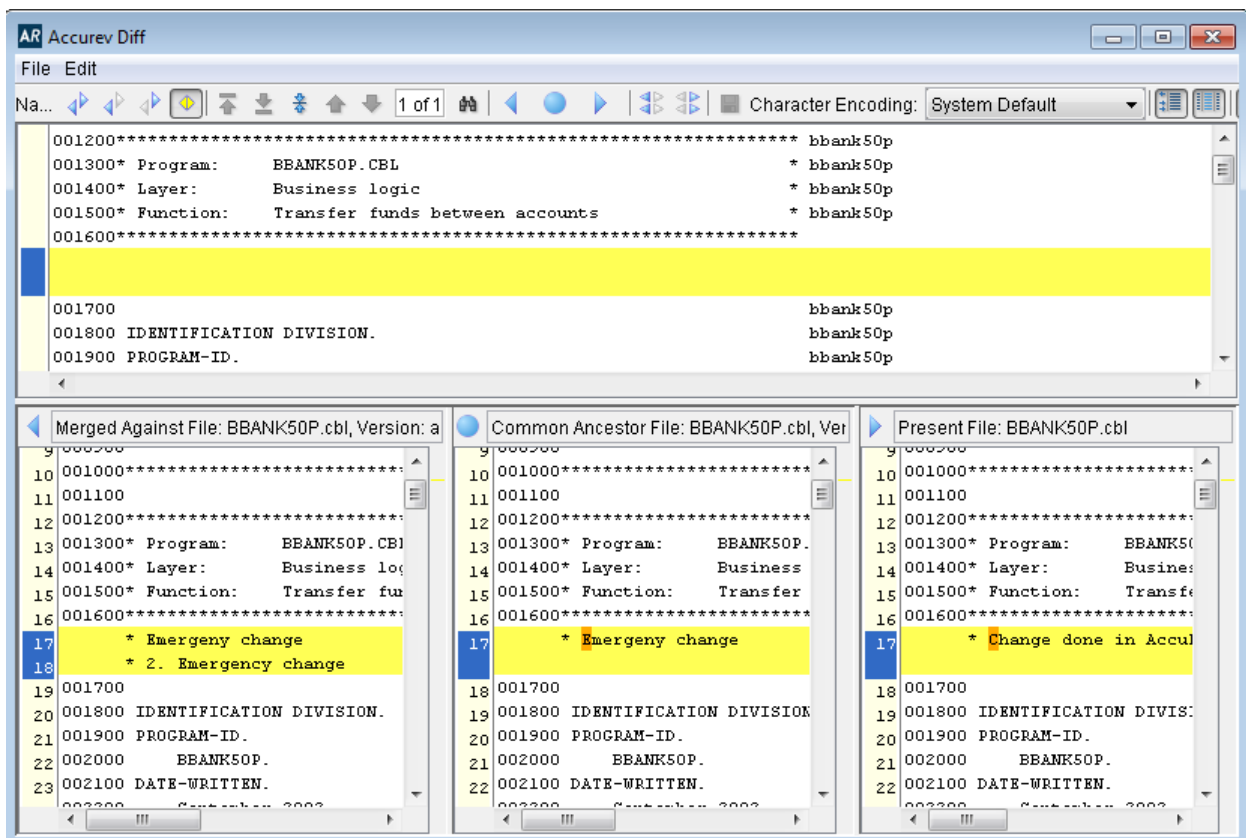
10. After merging the overlap status disappears and the file is eligible for the next promote. Select an item, use the context menu and click **Team** > **Promote**.

Parallel Release Development

1. To support parallel release development in AccuRev without a direct impact on the synchronization process, define at least two additional streams as children of the gated stream which is used for synchronizing files from AccuRev to Endevor.
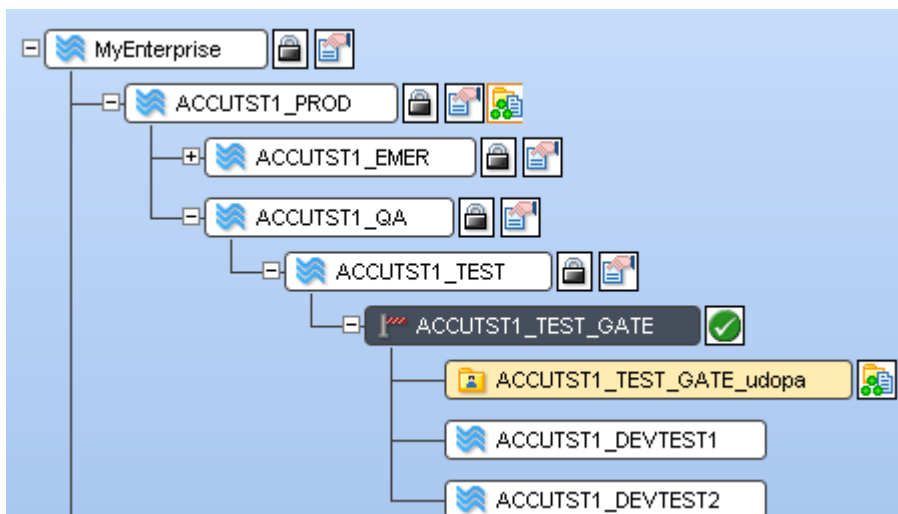
2. In Enterprise Developer, select the AccuRev workspace entry and use **New** > **Project…** to create two new workspaces based on the new streams associated to corresponding general Eclipse projects. Refreshing the stream browser should show a structure like in the sample below:
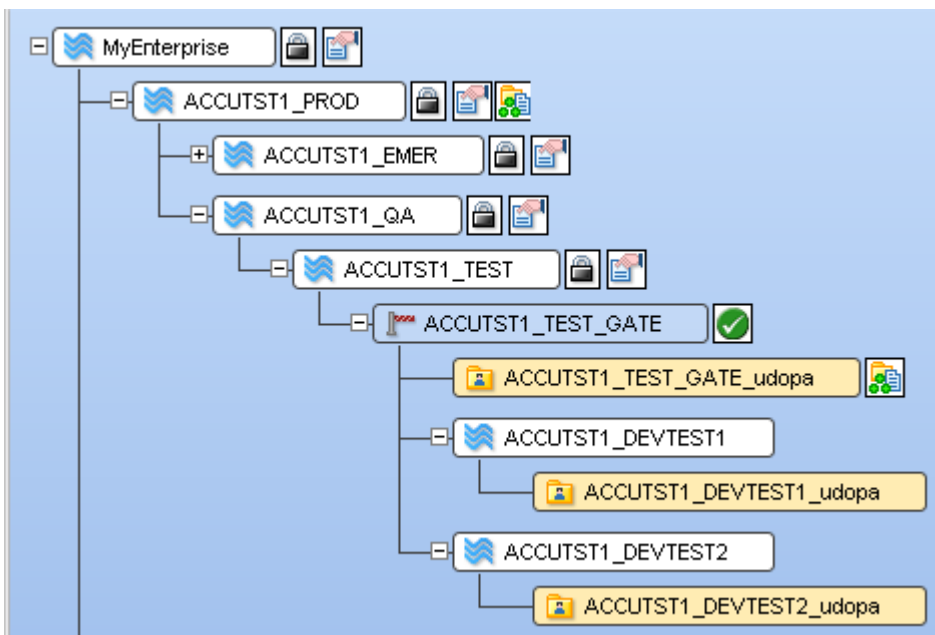
In this configuration, different teams could work independently from each other. Integration streams are available below the gated stream, before changes are synchronized to Endevor. The first team which promotes files to the gated stream would make their changes directly visible to the other teams, of course causing `stale` or `overlap` status in their workspaces which have to be resolved using the functions described in the previous chapters.

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