

# TUXEDO APPLICATION REHOSTING WORKBENCH

## PREMIER MAINFRAME REHOSTING TOOLSET

### KEY FEATURES

- Application asset inventory and dependency checking
- Robust migration of Online and Batch COBOL applications and related assets (Copybooks, 3270 BMS/MFS screens, etc.) to Tuxedo Application Runtimes for CICS, IMS, and batch
- Robust migration of JCL jobs and related assets (PROCs, SYSINs) to Tuxedo Application Runtime for Batch
- Automated schema mapping and generation of bulk data migration tools for DB2, VSAM, QSAM, and other mainframe datasets guided by Copybooks and DDL
- Automated generation of runtime configuration artifacts and deployment scripts, makefiles, etc.
- Efficient methodology and incremental tools for 10s of millions of lines of code
- Repeatability for consistent results over multiple iterations
- Extensibility through custom rules for project-specific COBOL, SQL, and JCL modifications

### KEY BENEFITS

- Consistency, accuracy, and high productivity minimize project cost, time and risks
- Industrialized, efficient migration process safely handles migration of very large applications
- Uniformity of transformations enables blended on-shore/off-shore teams
- Easy migration of maintenance changes reduces any “frozen” period
- Extensibility enables tailoring of the conversions to customer-specific needs and simplifies adding coverage for new technologies
- Cost savings shift IT budget from maintenance to innovation, help to increase business alignment

*Tuxedo Application Rehosting Workbench helps to simplify and accelerate mainframe rehosting by automating the code and data migration. Built on advanced language processing technology used in large scale migrations, it integrates the tools to adapt COBOL code, DB2 SQL, and transform JCL. It also includes data migration tools, which perform complete analysis of data definitions and access to generate data schemas and logical access modules, while creating data unload, reload, and validation tools for automated migration of VSAM datasets, flat files, and DB2 tables from the mainframe.*

### Simplify and Accelerate IBM Mainframe Application Migration

Tuxedo Application Rehosting Workbench helps organizations migrate mainframe applications and data to open systems without re-writing them to Java or .NET. It uses advanced program analysis and transformation capabilities to simplify and automate migration of COBOL-based CICS, IMS, and batch mainframe applications to Tuxedo Application Runtime for CICS and Batch, Application Runtime for Batch, and Application Runtime for IMS. The Workbench provides complete end-to-end lifecycle support from initially loading the mainframe source code to analyzing the entire code base, automatically converting code as required, creating deployment scripts, and automatically creating configuration files including CICS resource definitions and Tuxedo configuration files.

### Proven, Industrialized IBM Mainframe Migration Process

The automation of the migration process is key to predictable, on time delivery of the expected results. Companies that were deterred from migrating mainframe applications by high cost, risk, and lengthy projects can now accomplish these migrations – by themselves or with the help of Oracle partners – much quicker and achieve a much faster ROI.

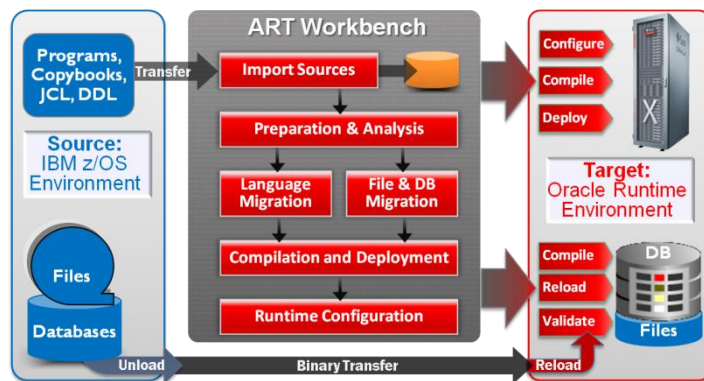


Figure 1. Migration Process using Tuxedo Application Rehosting Workbench

Multiple phases of a typical migration project – planning, preparation, conversion, testing, integration, and switch-over – are integrated into a guided, industrialized migration process, which is facilitated by the Workbench tools. To efficiently migrate large volumes of software assets, the cataloging and conversion tools run unattended over specified source directories. Once initial configuration has been completed, the process can be launched in batch mode to run end-to-end, or one step at a time. The workbench supports two modes of operation:

Tuxedo delivers a robust platform to run high-volume applications across distributed, heterogeneous computing environments, enabling transactions that stretch from customer-facing, business-critical applications to back-office processes, across any system, anywhere in the world.

Tuxedo Application Rehosting Workbench enables rapid and low risk migration of mainframe applications to Tuxedo Application Runtimes for CICS, IMS, and batch, which leverage Tuxedo foundation while running rehosted mainframe applications without changing business logic. This helps IT to regain control by reducing complexity of rigid IT infrastructure, providing choice and flexibility, and addressing mainframe skills attrition with simplified architecture and operations

- Editing configuration files by hand and launching tools from the command line
- Using the Eclipse plug-in which provides integrated GUI support for navigating project directories, maintaining configuration properties, and running the tools

The Eclipse plug-in provides a project navigator (left pane); area for displaying and editing various source components (middle pane); Progress Monitor, which shows files/directories being processed, a cheat sheet for guidance (far right pane); and a tabbed area with results logs and Cataloger reports (bottom pane). The ART dropdown menu provides access to the Prepare tools, the Cataloger, the four main conversion tools: Files, DB2, JCL, and COBOL, as well as the Deploy and Runtime Configuration tools and some useful utilities.

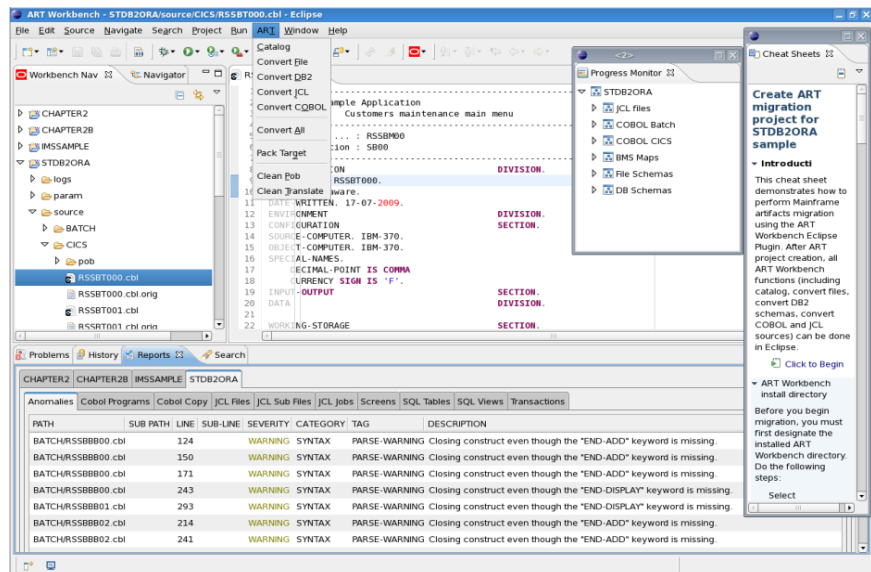


Figure 2. Tuxedo Application Rehosting Workbench in the Eclipse GUI

### Automatically Organizes and Catalogs COBOL, JCL, DDL Assets

The preparation phase identifies and collects all mainframe artifacts which are imported into the Workbench and checked-in to the source control system. Prepare tools help to pre-process the source components and get them ready for subsequent processing steps. The Cataloger parses all components, computes cross-references, builds the internal repository, and identifies any missing components or other anomalies. The Cataloger handles source code written in COBOL, JCL, DB2 SQL (DML and DDL), and BMS subset of IBM Assembler. The extensibility of the Workbench enables handling of additional languages, databases, and mainframe features through partner tools and custom extensions.

### Advanced Syntax Understanding

The Workbench uses an advanced syntax understanding engine to parse, store, and transform all program-related data. The initial cataloging process creates an abstract representation of the application programs and data definitions, which are then used for analysis of:

- Dependencies between all software elements
- Data flow, describing data item changes throughout the program
- Process flow, depicting the control structure at various levels of abstraction

Based on this analysis and configuration settings, the Workbench tools adapt COBOL components between compiler dialects, transform embedded DB2 SQL to Oracle SQL, convert JCL to batch job scripts, convert DB2 DDL and VSAM Copybooks to Oracle Database schemas, and generate tools (JCL/programs/scripts) for the bulk data migration.

**RELATED PRODUCTS:**

- Tuxedo
- Oracle Exalogic Elastic Cloud
- Tuxedo Application Runtime for CICS and Batch
- Tuxedo Application Runtime for IMS
- Tuxedo Application Runtime for Batch
- Oracle Berkeley DB
- Tuxedo System and Applications Monitor (TSAM)
- Tuxedo Mainframe Adapters (TMA)
- Tuxedo JCA Adapter
- Services Architecture Leveraging Tuxedo (SALT)
- Oracle GoldenGate
- Oracle Database EE

As a result of its high precision, uniform rule-based transformations, and effective automation, the Workbench-driven migration projects have experienced extremely low error rates, which reduces testing and debugging time, lowers overall project risk and cost, and results in much faster project delivery. The Workbench enables an industrialized migration approach, which has provided high efficiency and productivity in migrating very large mainframe applications with tens of millions of lines of code.

**Predictable, Efficient Code Migration with the COBOL Converter**

COBOL Converter adapts z/OS programs and copybooks developed in the IBM Enterprise COBOL to open systems COBOL compilers so that they will compile on the target open system, while maintaining the same application behavior. The tool handles multiple source files in parallel and performs multiple transformations in a single pass, including:

- z/OS COBOL adaptation to Micro Focus COBOL or COBOL-IT EE
- Adaptation to target platform file types and naming structure
- Mapping embedded hex values from EBCDIC to ASCII (e.g., printer control)
- Embedded SQL adaptation from DB2 to Oracle (e.g., SQL syntax, SQLCODE)
- Changes required by File to Oracle conversion or component renaming
- Normalization of the EXEC CICS statements for the CICS pre-processor

The resulting programs can be compiled and run on the target platform with the same behavior as on the z/OS. The EXEC CICS statements are preserved, allowing developers to continue maintaining applications in the familiar idiom. The tool uses parameters created by the File and DB2 migrators to guide code changes related to data migration. It also allows custom transformation rules, which can be specified in a post-processing rule file.

**Robust, Extensible IBM Batch JCL Migration**

The JCL Converter transforms z/OS JCL jobs to run on the Tuxedo Application Runtime for CICS and Batch. The converter relies on the extensive set of built-in JCL functions and standard utilities provided by the runtime. This simplifies the conversion and produces native job scripts analogous to the original JCL. The converted scripts, based on customizable ksh templates, retain the same job step flow and are easily extensible for future needs. Similar to the COBOL Converter, the JCL Converter does the conversions in a single pass, including:

- Original JCL steps populated in the job script with conditions and return codes
- File assignments with access modes, disposition, GDG support, spool files, etc.
- Invocation of COBOL programs and most common utilities

**Automated Data Migration for Flat Files, VSAM, and DB2**

While migrated applications can continue to use mainframe data (e.g., via DB2 Connect), to accomplish a complete migration and maximize the ROI by switching off the mainframe, most customers choose to migrate data off the mainframe and to leverage Oracle's horizontal scalability. The Workbench provides migration tools for mainframe datasets and DB2 tables:

- **File Migrator**, which supports File to File migration (for flat files and VSAM) and for VSAM files migration to Oracle Database or DB2 UDB
- **DB2 Migrator**, which supports migration to Oracle Database

The **File Migrator** supports most z/OS file organizations: QSAM, VSAM (KSDS, RRDS, and ESDS), PDS, and GDG. VSAM files are supported by the Micro Focus COBOL filesystem or Oracle Berkeley DB, but can also be migrated to Oracle Database to support data sharing and locking across multiple nodes and broader access from other enterprise systems. The tool supports OCCURS and REDEFINES clauses in copybooks and provides configurable choices of sub-tables, opaque fields, or extended columns for redefined fields.

The **DB2 Migrator** converts the following DB2 objects to Oracle Database schema:

#### DB2 Objects Converted to Oracle Database

TABLE	INDEX	CONSTRAINT
COMMENT	VIEW	SEQUENCE
SYNONYM	IDENTITY	COLUMN

The tool also permits changing table or column names in the DDL source file to avoid a conflict with Oracle reserved words or for a re-engineering needs. The DB2 Migrator handles data type and column property conversions between DB2 and Oracle in the generated DDL and in adapting SQL calls in COBOL programs for the following data types:

#### DB2 Datatypes Converted to Oracle Database

CHAR(length)	VARCHAR(length)	DECIMAL(p)	DECIMAL(p,0)
Decimal(p,s)	NUMERIC(...)	DEC(...)	SMALLINT
INTEGER	TIMESTAMP/TIMES	DATE	TIME
DOUBLE	FLOAT(prec)	REAL	CLOB/BLOB

Guided by the data definitions in Copybooks and DB2 DLL, File and DB2 Migrators generate all the tools necessary for bulk data migration, including :

- Unload JCL to extract the data on the mainframe for binary transfer to the target
- Transcoding COBOL programs, which apply adaptation rules (e.g., EBCDIC to ASCII with customizable code pages, timestamp format changes, etc.)
- Reload scripts to reload transcoded data into files or databases on the target and SQL\*LOADER control files for high speed data load in to Oracle Database

#### Tuxedo Runtime Configuration and Automated Deployment

Following the conversion of the programs and data, the Workbench facilitates the compilation, configuration, and deployment process to the target environment supported by Tuxedo Application Runtimes for CICS, IMS, and batch. Leveraging a configuration and deployment wizard that prompts the user for required settings, the Workbench automates:

- Conversion of the IBM CICS system definition (CSD) file with CICS resources configuration into analogous configuration data for the Tuxedo CICS runtime
- Generation of makefiles for running CICS and SQL pre-processors (i.e., Pro\*COBOL) and specified compiler, and root makefile for the entire application
- Creation of Tuxedo ubbconfig for Tuxedo domains with CICS and batch runtimes and deployment scripts together with tools to start/stop different environments

#### Contact Us

For more information about Tuxedo Application Rehosting Workbench, visit [oracle.com](http://oracle.com) or call +1.800.ORACLE1 to speak to an Oracle representative.

#### Summary

Tuxedo Application Rehosting Workbench enables dramatically faster, cheaper, and safer mainframe component migrations to open systems, resulting in shorter migration projects, reduced migration cost and risk, and faster realization of ROI and other benefits.



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