Astadia THE MAINFRAME TO CLOUD EXPERTS

CODETURN: AUTOMATED CODE TRANSFORMATION

FACT SHEET

Astadia's CodeTurn is a powerful tool to automatically transform legacy source code into modern source code that is both very well maintainable and 100% functionally equivalent to the original. It is typically used in conjunction with other Astadia tools, such as the legacy data migration tool DataTurn and the automated testing tools TestMatch and DataMatch.

AT A GLANCE

CodeTurn takes an application's source code and automatically transforms it into functionally identical sources, ready to run within an alternative environment on the same platform or on a different platform altogether.

Since both the transformation and the testing are fully automated, the outcome of the project is highly predictable in terms of risks, costs, and duration.

The migrated application relies on native industry standard technologies.

THREE STRONG PROMISES

All Astadia's conversions ensure three types of equivalence:

Functional equivalence

The migrated application's behavior is identical to that of the original one.

Performance equivalence

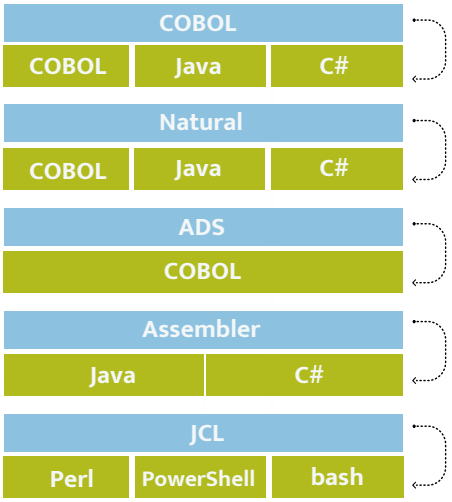
The migrated application will perform at least as well as the original one (assuming adequate infrastructure).

Maintenance equivalence

The maintenance of the migrated application will be comparable in effort to the original application.

OVERVIEW

CodeTurn is currently available for the following technologies:



CodeTurn also transforms any embedded statements in the COBOL programs, such as those accessing an IDMS, DB2, or ADABAS database, or CICS. If other languages, such as PL/I or EGL, are in scope of the application migration, Astadia works with established migration partners to offer a complete solution.

AUTOMATED TRANSFORMATION

CodeTurn integrates all aspects of the transformation to automatically produce high quality, functionally equivalent code.

Configurability

CodeTurn consists of several language parsers, analyzers, rule-based convertors and generators that together can perform complex transformations on existing source code. The convertors and generators can be easily configured to produce optimal code (e.g. adhere to company specific coding standards).

Native Code

The generated code will run as a native, first-citizen application on the target infrastructure. No sandboxing or emulation is involved.

Maintainability

CodeTurn keeps the transformed code concise, readable, and maintainable, without code blow, by centralizing pieces of code in libraries and software services, which are an integral part – delivered in source code format – of the produced converted code.

TP-Monitors

CodeTurn will also handle the automated transformation and functional equivalence of code that runs under CICS or IDMS (z/OS or z/VSE) as well as OpenUTM (BS2000/OSD) environments.

Automated Testing

CodeTurn migrated applications integrate with Astadia's automated testing products TestMatch and DataMatch to prove 100% functional equivalence with the original application. See the TestMatch and DataMatch Fact Sheets for further details.

Screen Definitions

Code Turn converts the screen definitions to XML and offers a standalone WYSIWYG tool to edit them.

Extensibility

CodeTurn is designed in such a way that it can flexibly be extended to cover additional source and target programming languages. At the same time, third-party conversion tools have already been integrated to cover the conversion of legacy languages such as PL/I and EGL.

Batch and Utilities

Astadia provides drop-in replacements for the commonly used mainframe system utilities to complement the conversion of batch applications and JCL. Additional or custom utility replacements are typically added based on project specific requirements.

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DATATURN: AUTOMATED DATA CONVERSION

FACT SHEET

AT A GLANCE

DataTurn is a powerful tool that provides automated transformation of data structures and conversion of data from legacy data stores to relational databases – running either in the Cloud or on premise. It helps liberating valuable business systems from their dependency on non-strategic, legacy and often costly technologies.

PRODUCT HIGHLIGHTS

- Supports a variety of source and target data stores
- Easy to use graphical interface
- Command line interface for automation and scripting of bulk processes
- Cutomization via a template based approach
- Mass configuration via export/import
- Mainframe EBCDIC to open platform ASCII solution

SOURCE & TARGET DATA STORES

Source data stores

DataTurn supports the migration of the following data stores. For each data storage technology, all key functionalities are mapped to equivalents in the target RDBMS:

Source	Main Functionalities
File (ISAM, VSAM, SAM, ...)	Records / Fields, Group/REDEFINES Fields, OCCURS Fields, Primary Keys, Alternate Keys
Network DB (IDMS, UDS,...)	Schemas, Subschemas, Areas, Records/Fields, Group/REDEFINES Fields, OCCURS Fields, DBKEYs, Calc Keys, Sort Keys, All Set Types (including System and Multimember sets and preserving set order)
Adabas	PE fields, MU fields, (super/hyper) descriptors...
IMS	Databases, Segments, Fields, (Concatenated) Keys, Parent/Child Relations

DataTurn is also used for migrating other data stores, but only in the context of a full Astadia migration project.

Target RDBMS

DataTurn supports all market-leading RDBMS vendors (Oracle, SQL Server, DB2) giving customers the flexibility to choose the product most suited to their needs and standards. Support for popular open-source and cloud-managed RDBMS systems like MySQL and PostreSQL has been added.

As an alternative for RDBMS targets, DataTurn supports migration of ISAM/VSAM files to files with compliant formats on open platforms, including EBCDIC to ASCII encoding translation.

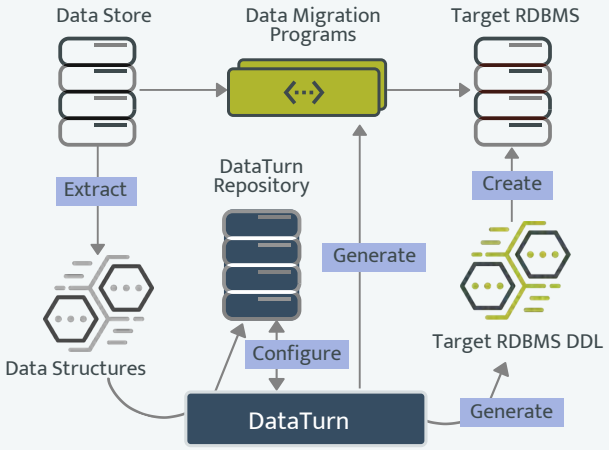
EASY TO USE

DataTurn visualizes the original source descriptions and resulting target descriptions. Configuration changes can be checked immediately.

HOW IT WORKS

The DataTurn migration process always consists of following five steps, irrespective of the source and target technologies:

1. Upload the structural data definitions into the DataTurn Repository
2. Configure the migration mappings
3. Generate data migration programs and target RDBMS scripts
4. Setup the target RDBMS
5. Run the data migration programs



DATATURN AND ADD-ON SERVICES

As a standalone product, DataTurn enables you to migrate data to a modern RDBMS.

On top of that and extensively using DataTurn itself, Astadia can provide full migration project services, including:

- Generation of data access layers
- Generation of extra trigger logic
- Conversion of data access statements in code

REFRENCES

Astadia helped more than 200 organizations move off of their mainframes, having completed numerous data conversion projects for IDMS, UDS, Adabas, ISAM, VSAM, LEASY, DPT data sources to Oracle, DB2, SQL Server, and file targets.

Each of these projects has been delivered on time, within budget and to the complete satisfaction of the customer. Visit our website for case studies and more in-depth information.

THREE STRONG PROMISES

All Functionality is Mapped

Not only the application data itself is being dealt with, but all aspects on which application code can depend, such as implicit key fields, implicit set order etc., are made available in the target RDBMS.

Data Integrity is Preserved

Two independent mechanisms are provided to verify data integrity:

- The data migration programs generate full statistics on the original (unloaded) and target (loaded) data stores.
- Independent data verification programs can get generated too, to dump the data from both the source and target data stores in a format that allows easy comparison.

Data Availability is Ensured

The latest IT development tools on the market are optimized for quick data access and rapid development on databases. Especially the development of Java, .NET or other Internet applications will be speeded with the availability of native APIs and programming tools for data access.

Because the migration to an RDBMS will provide your application with a clear separation of its data-layer, it will allow your organization to implement a modern client/server or three-tier networked applications architecture in one easy process.

Astadia is the market leading mainframe modernization consulting and systems integration boutique. A worldwide IT consulting firm, we specialize in moving IBM and Unisys mainframe applications and databases to distributed and cloud platforms.

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TESTMATCH: AUTOMATED TESTING

FACT SHEET

AT A GLANCE

Astadia's TestMatch provides automatic testing of mainframe OLTP (terminal based Online Transaction Processing applications). It can be used to facilitate the migration of such legacy applications to open systems, or it can provide an automated regression test suite for a legacy application.

PRODUCT HIGHLIGHTS

Centralized test scenario recording

All user interactions can be recorded centrally on an IBM or Siemens mainframe using standard tools (no client-side or server-side installation of Astadia tools). Since recording is done at the network level, it works regardless of the development technology (IDMS, BMS, DMS, Natural). Many protocols are supported: 3270 (IBM), 9750 (Siemens), Entire/X, MQ, TCP/IP.

Visualization

TestMatch visualizes test scenarios and sessions: this includes the terminal contents as well as all attributes that are typical for terminal based applications: protected/editable, MDT bit, reverse-video, colors.

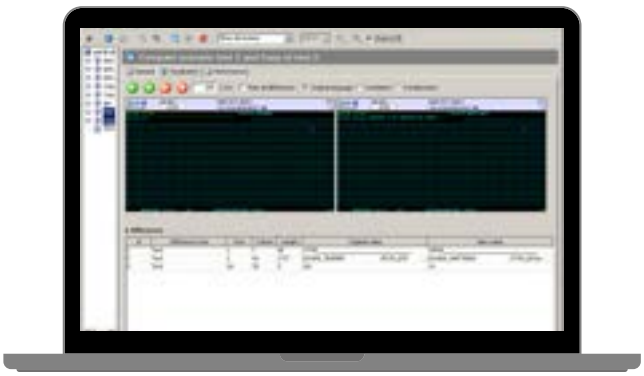
Replay

TestMatch can replay the recorded scenarios, either against the migrated application (as a migration testing tool) or against the original application (as a regression testing tool). Normal replay can either include or leave out user think time. Stress-testing replay can launch many scenarios in parallel.

Comparison

The integrated diff tool shows a side by side comparison of a recorded scenario and its replayed counterpart.

Side-by-Side Comparison

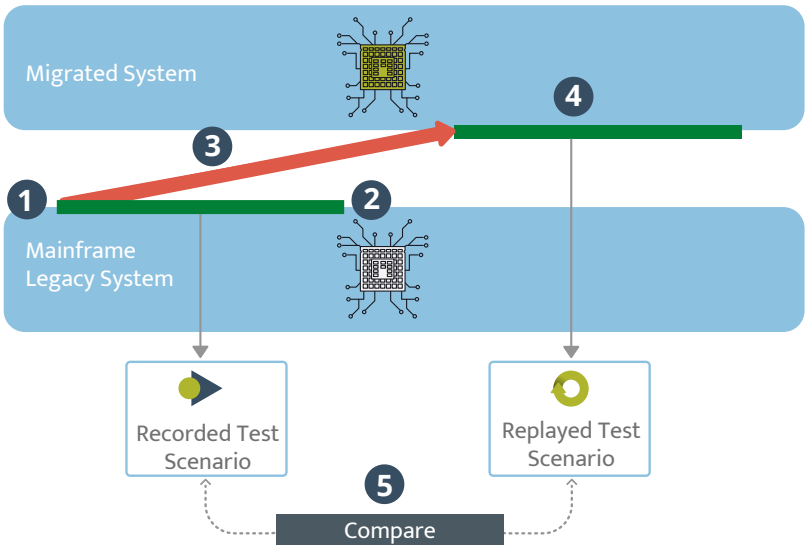


Performance Analysis

Test analysis

TestMatch provides detailed analysis of response times and throughput, and also contains helpful utilities to detect performance problems. It calculates elaborate test scenario coverage statistics and the pass rate of replayed tests.

TESTMATCH IN ACTION



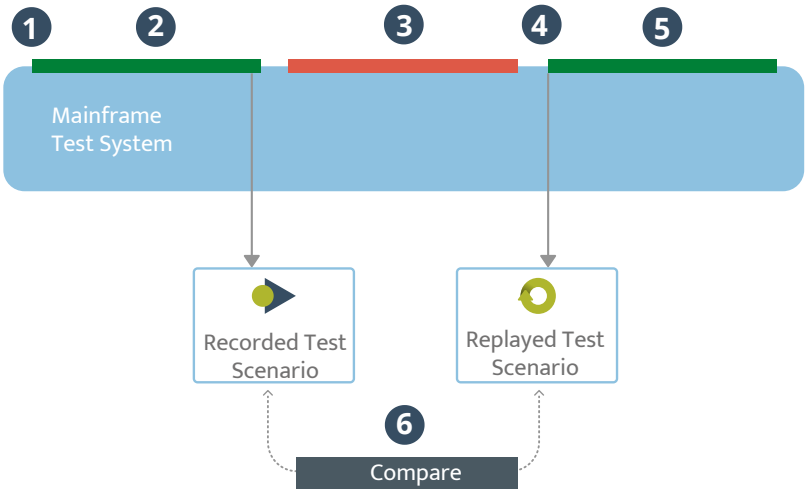
TESTMATCH DURING A MIGRATION PROJECT

1. Create a snapshot of database and program code
2. Record user interactions on the mainframe
3. Convert data and code
4. Replay the recorded user interactions on the new system
5. Compare the screens from the original recording with those of the replay

During a migration project, TestMatch is used to ensure the 1-to-1 functional equivalence between the original application and its migrated counterpart. For software migrations, Astadia uses its Migratonomy project management methodology. Anubex Migratonomy applies a migration/testing cycle as depicted above in consecutive, always shortening cycles.

TESTMATCH AS A STANDALONE TOOL

1. Create a database snapshot
2. Record user interactions on the mainframe
3. Implement functional changes
4. Restore database
5. Replay user interactions
6. Compare scenarios and accept changes or fix the implementation



Outside of a migration context, TestMatch is used as a regression testing tool on the legacy test system. Initially, a baseline regression test suite is established (step 1 and 2).

After the implementation of a functional change, the test suite is run to verify that only the desired changes took place and any undesired side-effects of these changes are fixed in the implementation. The desired changes can then be accepted into the regression test suite too, so that this test suite evolves together with the application and at any point reflects the current functionality of the system.

Astadia THE MAINFRAME TO CLOUD EXPERTS

DATAMATCH: AUTOMATED BATCH TESTING

FACT SHEET

AT A GLANCE

DataMatch is a powerful, scriptable database comparison tool. It enables quasi automatic testing of batch jobs, and can help reduce testing effort dramatically.

DataMatch and its sibling product TestMatch (for automated on-line testing) form the core of the Astadia Automated Testing offering for mainframe migration projects.

DataMatch also works closely together with DataTurn, for automated data conversion.

Astadia's mainframe migrations guarantee 100% functional equivalence. This means that running a converted batch job on the new platform should yield exactly the same results as running the original JCL job on mainframe.

To prove this, DataMatch basically compares the output of a converted batch job (e.g. Perl on Linux or PowerShell on Windows) with the "desired" output i.e. that of the original JCL job on mainframe. While this sounds straight-forward at first, several issues make this a challenging task:

1. How to compare the contents of exotic mainframe databases such as IDMS and ADABAS with the converted relational database on the target platform?
2. Data volumes, typically in the Terabyte range, might prohibit "naive" bulk-comparisons.

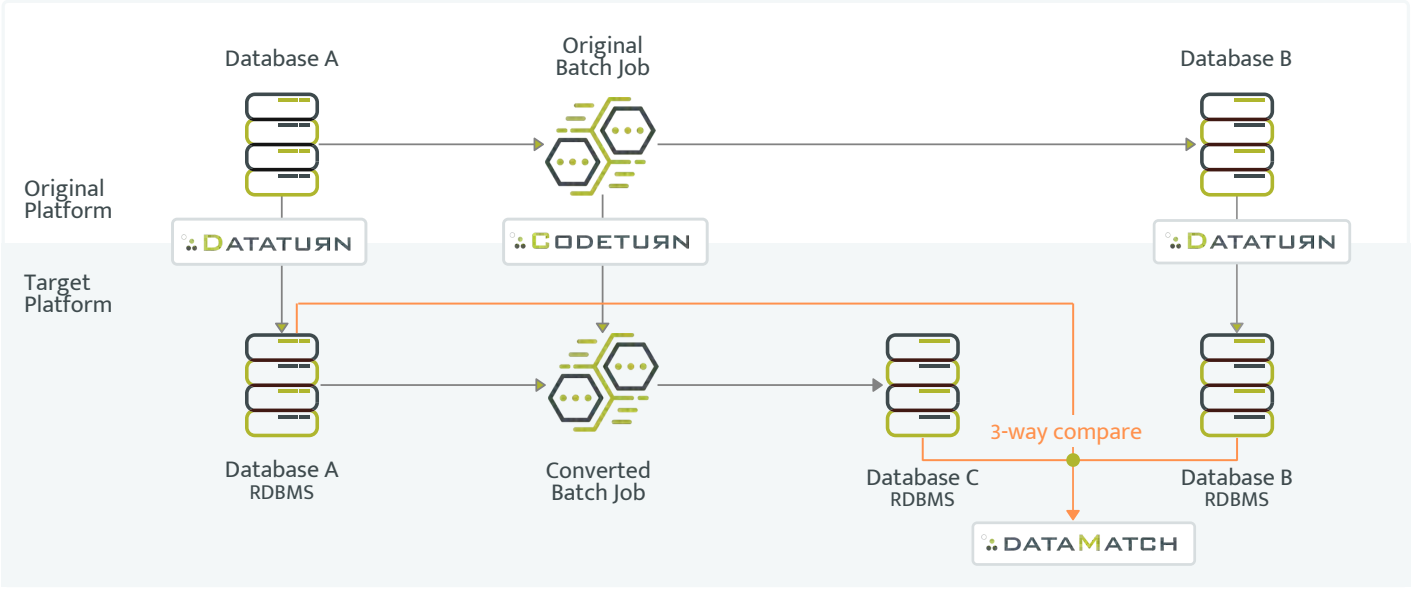
DataMatch is designed with these challenges in mind. The result is a unique and flexible tool that makes batch testing a breeze in any situation.

OVERVIEW

DataMatch has two main components:

- A graphical user interface where database connections are set up, comparisons are configured and results are analyzed.
- A scriptable engine that can execute previously configured comparison runs, and that can be easily integrated in other testing frameworks, logging and monitoring tools etc. This way, even long-running batch jobs can be tested without manual intervention.

The DataMatch GUI offers powerful tools to analyze and track down any differences found. It can zoom in on specific differences, or detect patterns in the differences using various correlation techniques.



HOW IT WORKS

The process of migrating and testing a batch job is described in the above diagram. It starts by capturing the initial state of the database (A) on the mainframe and transferring that to the target platform. If the original database is not already relational, it is converted using DataTurn.

Then, both the original job and the converted job are run. The final database state on mainframe (B) is the "desired" result; the final database state on the target platform (C) should be identical.

Before comparison takes place, database (B) is converted to a relational form again if needed.

As a last step, DataMatch performs the actual comparison to effectively prove that both jobs have produced the same result.

These steps can be easily automated so they can be repeated or re-used for subsequent jobs. Moreover, as long as database states A and B are retained, the converted batch job can be re-executed immediately, allowing the test to be repeated quickly and as often as required.

DataMatch internally uses JDBC to access all three databases (A, B, and C) so there is no limitation as to what databases can be compared.

THREE-WAY COMPARE

While comparing the database states, three types of differences can occur:

1. The same record in (B) and (C) contains different data.
2. A record occurs in (B) and not in (C).
3. A record occurs in (C) and not in (B).

While type 1 are trivial, type 2 and 3 are not: does a missing record in (C) mean that it was not inserted, or that it was deleted by mistake? This can only be found out if we also take the initial database state (A) into account. DataMatch effectively implements this three-way compare.

OTHER USES OF DATAMATCH

DataMatch is most often used in the context of mainframe migrations and particularly in testing of JCL conversion. However, it is just as useful in various other situations. For instance:

- Regression testing in day-to-day maintenance. Programs that are unaltered should produce the same output before and after the release.
- DataMatch can be used to visually inspect the result of bulk data operations (e.g. mass cleanup of historical data from tables).
- When performing system upgrades (operating system upgrade, database upgrade), DataMatch can validate that programs still work correctly after the upgrade.