MANAGEMENT OVERVIEW

A GUIDE TO THE BENEFITS OF USING X-DATA

X-Data

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X-Data is a comprehensive Testing, Data Management and Verification tool which will meet the various software testing requirements on IBM i. X-Data greatly improves productivity and software quality, whilst ensuring compliance with audit and legal requirements.

X-Data has the following key benefits:

- Automated Regression Testing - Allows for multiple Test runs / Test checkpoints and automatically compares test results against the base values.
- Identifies all sensitive or 'Confidential Data' and replaces it consistently with fictitious values to provide scrambled data that is usable.
- Sophisticated and intelligent selection criteria interface combined with full data model allows easy creation of complete test data subsets
- Useable from GUI or Green Screen so you can work in your favourite environment
- X-Data functions can be automated to prepare test data or run tests as often as required.
- Satisfy compliance requirements to take all reasonable steps to ensure quality of software.
- User-friendly and doesn't require any changes to new or existing code to be effective it works with what you've got and slots easily into your existing workflow
- Verify and report on referential integrity of the entire live data
- And much more…

Automated regression testing, the user-friendly way

The cost of software defects in a production environment is considered to be up to 100 times greater than that of the same defect when detected and corrected in earlier stages of development. An undetected error can have potentially disastrous consequences for a business.

Complete “by the book” tests engender skyrocketing costs that are not compatible with the cost-effectiveness inherent to business applications, so there will always be an element of compromise in the type and amount of testing that is done.

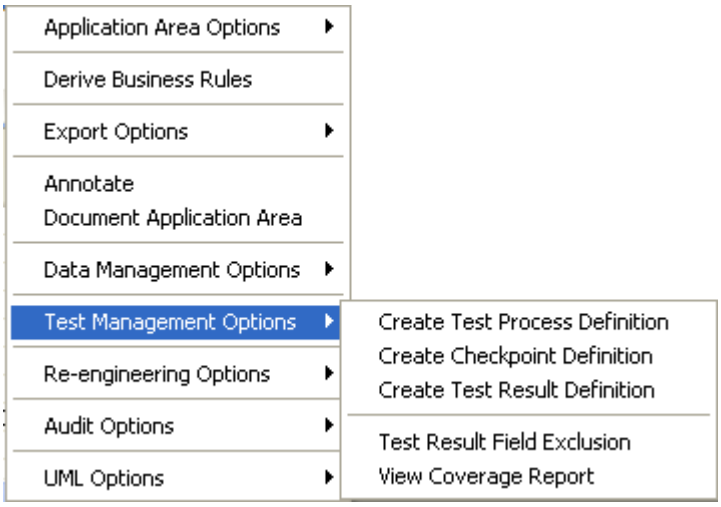
Verifying that nothing has been broken – regression testing – is the second key area of functional testing. Here we will very often be running the same tests over and over again across many generations of changes. Because of this, regression tests are a natural candidate for automation. And as ever in the software world, automation is the key to achieving considerable gains in quality, at a fraction of the cost.

X-Data helps in achieving repeated gains in functional test operations by automating the regression tests. It provides a framework and the appropriate tools which let you configure and automate test cases, which will then run as batch jobs to programmatically detect any unwanted differences in the results and to review those differences in a user-friendly manner.

The framework, tooling and a user-interface facilitates batch test result comparison, thus increasing reliability and productivity of the batch tests. The Test Management Options facilitate:

- Setting up the Test environments
- Defining and populating checkpoints
- Repeatedly executing the tests
- Comparing the resulting images
- Reviewing the differences in a user-friendly manner

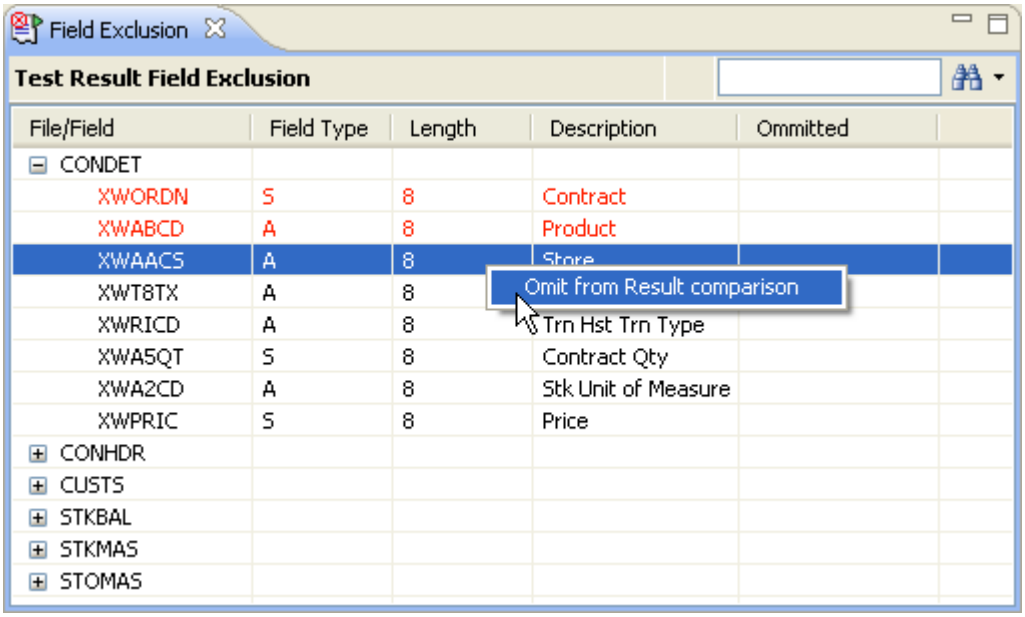
The set of files listed under the application area define the test



Test Management Options

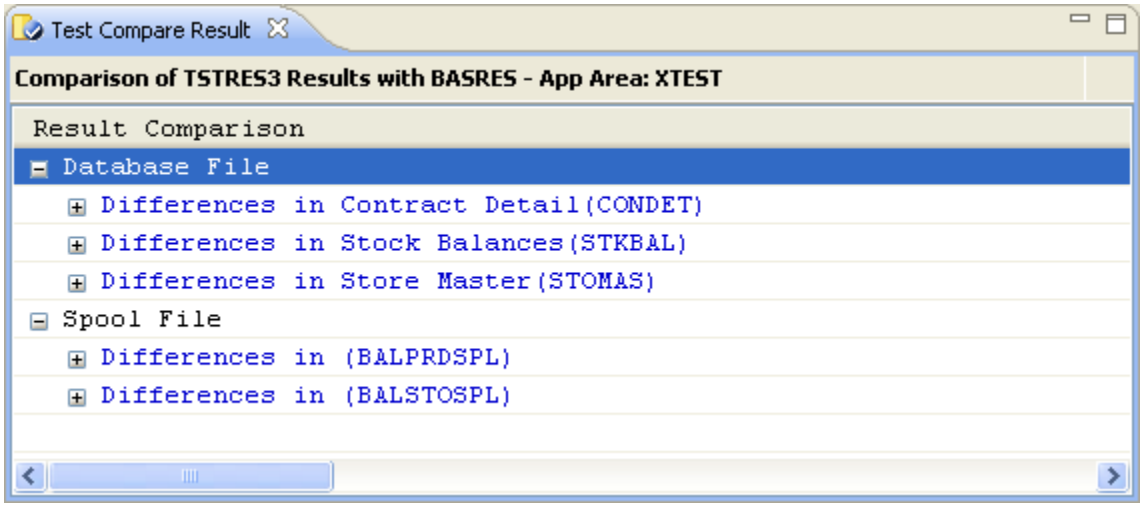
The interface is pretty simple to use. Besides creating the Test process, checkpoint and Test result definitions, the user can exclude a field from the Test Result on the 'Test Result Field Exclusion' view.

Test Result Field Exclusion



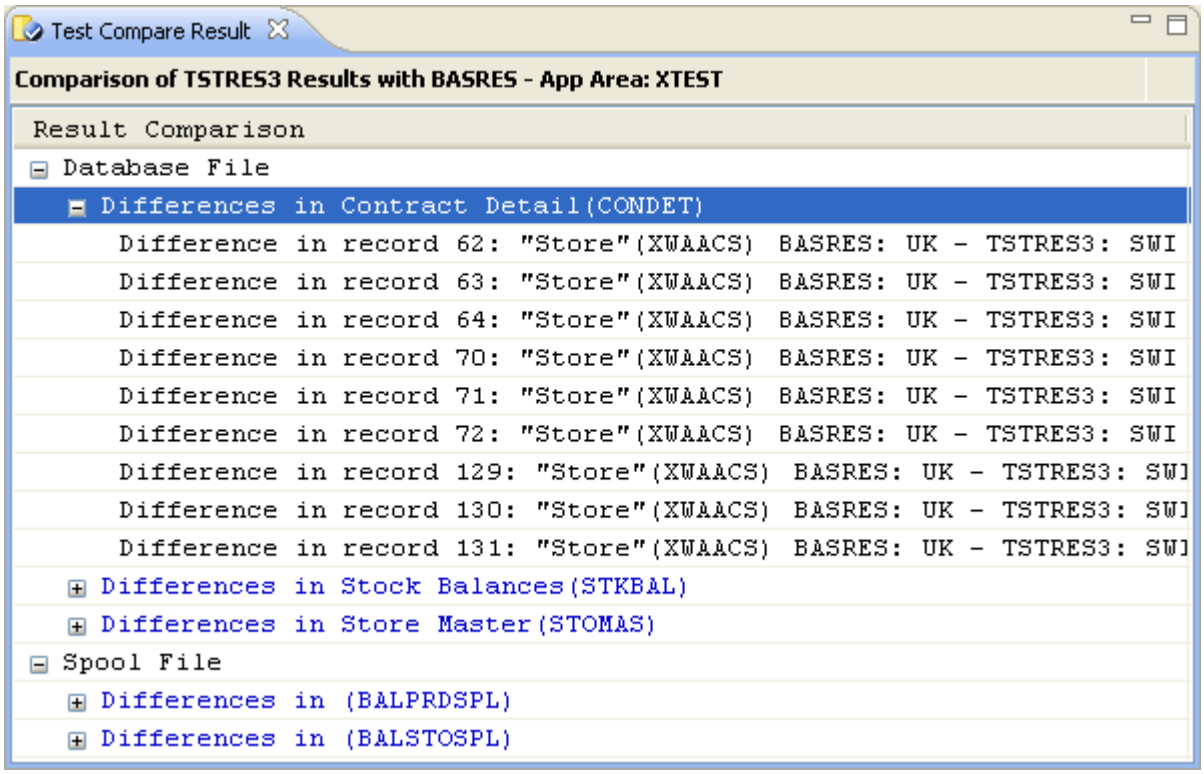
The Test Result Comparison option presents a view where the user can compare the results against the base results.

Test Comparison Result



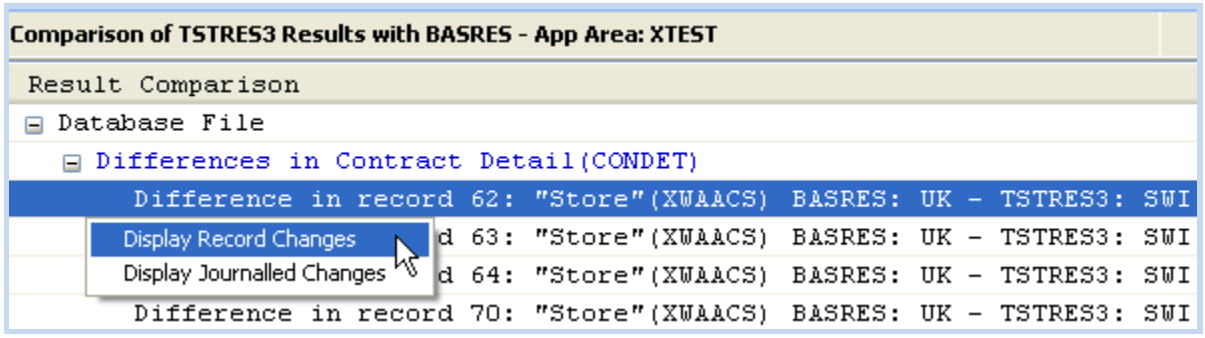
The listed entries (files) can be expanded to see the differences.

Test Comparison Result Expanded



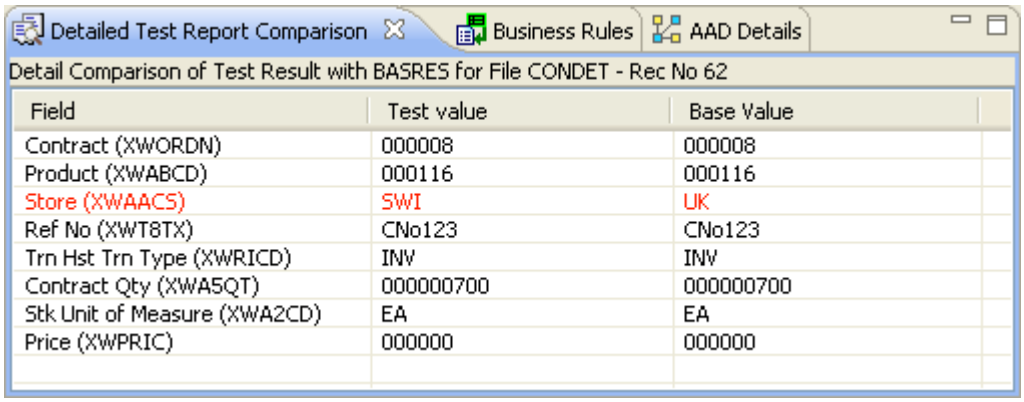
The 'Display Record Changes' option provides a detailed view for analyzing the comparison results.

Display Record Changes option on Compared Results



The modified records for the selected file are presented in a new window.

Modified record as compared against Base record



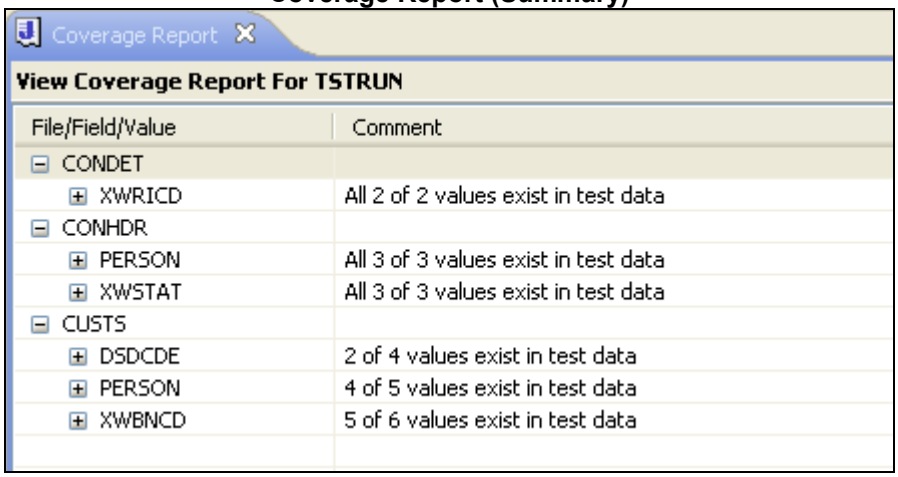
Field	Test value	Base Value
Contract (XWORDN)	000008	000008
Product (XWABCD)	000116	000116
Store (XWAACS)	SWI	UK
Ref No (XWT8TX)	CNo123	CNo123
Trn Hst Trn Type (XWRICD)	INV	INV
Contract Qty (XWA5QT)	000000700	000000700
Stk Unit of Measure (XWA2CD)	EA	EA
Price (XWPRIC)	000000	000000

The user can repeat this as and when required. Once the environment is configured, it can be used over the entire application lifecycle.

For accurate and reliable software testing, it is utmost important to have the valid test data. At the same time, the organisation's data cannot be put to risk. X-Data ensures this by using intelligent obfuscation algorithms to safeguard data privacy.

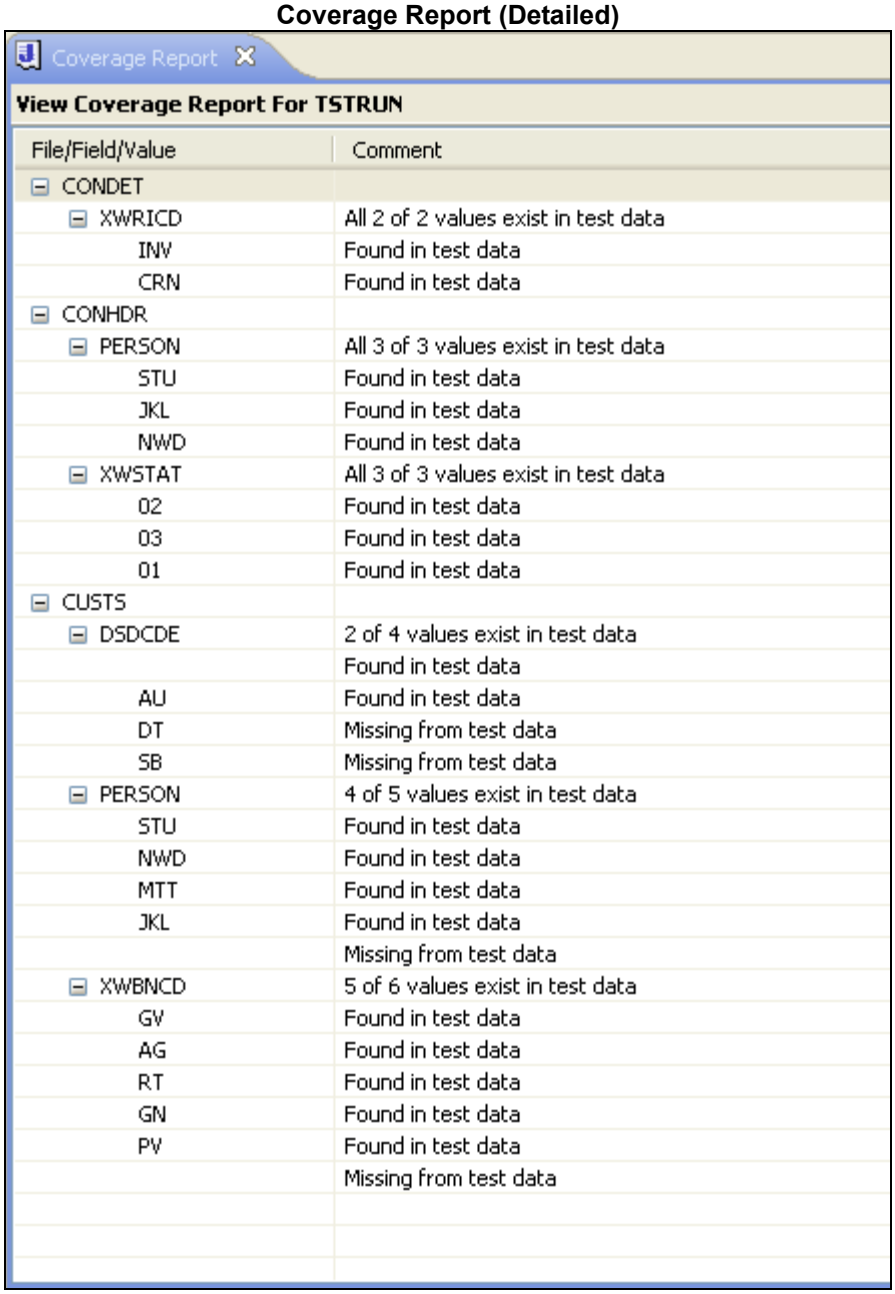
The Test Management Options gives an option to 'View Coverage Report' both in Summary and Detailed form.

Coverage Report (Summary)



File/Field/Value	Comment
⊟ CONDET	
⊞ XWRICD	All 2 of 2 values exist in test data
⊟ CONHDR	
⊞ PERSON	All 3 of 3 values exist in test data
⊞ XWSTAT	All 3 of 3 values exist in test data
⊟ CUSTS	
⊞ DSDCDE	2 of 4 values exist in test data
⊞ PERSON	4 of 5 values exist in test data
⊞ XWBNCD	5 of 6 values exist in test data

Coverage Report (Detailed)


Coverage Report

View Coverage Report For TSTRUN

File/Field/Value	Comment
CONDET	
XWRICD	All 2 of 2 values exist in test data
INV	Found in test data
CRN	Found in test data
CONHDR	
PERSON	All 3 of 3 values exist in test data
STU	Found in test data
JKL	Found in test data
NWD	Found in test data
XWSTAT	All 3 of 3 values exist in test data
02	Found in test data
03	Found in test data
01	Found in test data
CUSTS	
DSDCDE	2 of 4 values exist in test data
	Found in test data
AU	Found in test data
DT	Missing from test data
SB	Missing from test data
PERSON	4 of 5 values exist in test data
STU	Found in test data
NWD	Found in test data
MTT	Found in test data
JKL	Found in test data
	Missing from test data
XWBNCD	5 of 6 values exist in test data
GV	Found in test data
AG	Found in test data
RT	Found in test data
GN	Found in test data
PV	Found in test data
	Missing from test data

Construct high quality, secure test databases quickly, easily and repeatedly

Whether software testing takes place in-house or is outsourced, the insecurity of the Test data is always of prime concern. An organization's data, be that of its employees, customers or any other sensitive data cannot be compromised with at any cost. It is the organization's responsibility to ensure that the data privacy is secured and at the same time accurate and valid data be made available for software testing.

X-Data scrambles sensitive data while retaining the integrity of special formats such as phone numbers, postal code, etc.

It removes all the information that could identify a person or organization, etc. from a set of data. It does so by using random dictionaries of words and numbers so names and addresses would contain words and numbers as appropriate after cloaking so are readable and usable when testing software. Where the information being cloaked is used as key it is updated throughout the data set so that the data is consistent. This enables the user to copy or subset a live database to a test database and protects all sensitive data.

A support function is also provided generating replacement data using the client's database. This function digs out pieces of information (e.g. First names and Last names) and using them in a random fashion when running the 'Data Replacement' step.

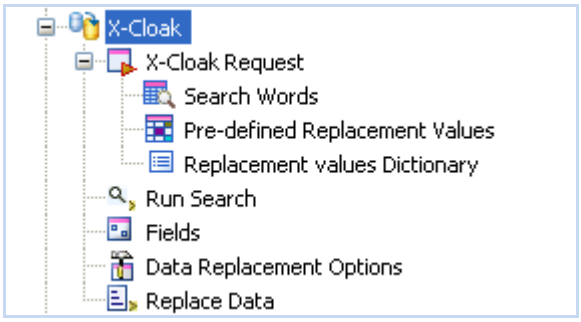
The tool identifies all sensitive, 'Confidential Data' data and replaces the data with fictitious values. This enables the user to copy or subset a live database to a test database and protects all sensitive data.

It works as a project which consists of different processes. These processes are set up and executed in separate stages like:

- Establish search arguments to identify fields with the sensitive data
- Execute searches to build list of fields with potentially sensitive data
- Execute the data replacement process

X-Sanitize (aka X-Cloak) is an integral part of the X-Data toolset.

X-Cloak node



X-Sanitize allows for working with the Search Words where the search criteria are used to identify the fields in the database requiring its current data to be replaced with non-sensitive data.

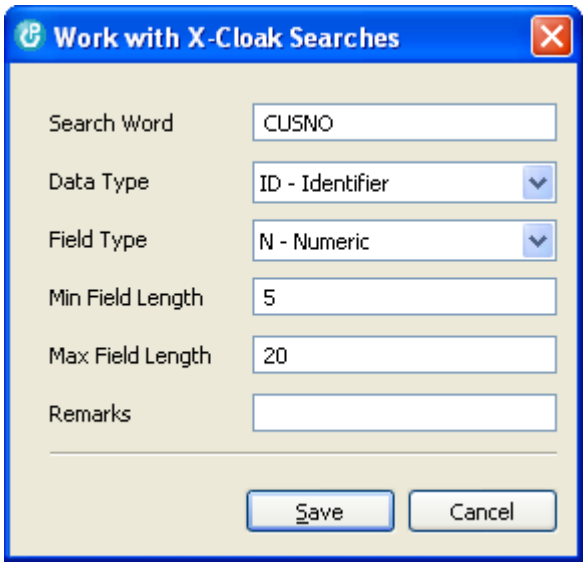
Work with Search Words

Search Words for XAN4CDXA

Search Word/Exclusion	Data Type	Field Type	Min length	Max Length	Remarks
ADDRESS	Address	Character	30.0	80.0	Address
COMPANY	Organisation	Character	20.0	80.0	Organisation
CONTACT	Name	Character	30.0	50.0	
COUNTRY	Address	Character	30.0	50.0	Country
FAX	Phone	Character	8.0	20.0	Fax / Phone number
FIRST	First Name	Character	20.0	25.0	
INTERNET	URL	Character	30.0	256.0	Web Site / Internet Address
LAST	Last Name	Character	20.0	30.0	Last NAme
MAIL	eMail	Character	30.0	256.0	E-Mail Address
NAME	Name	Character	20.0	80.0	
ORGANISATION	Organisation	Character	20.0	80.0	
PHONE	Phone	Character	8.0	20.0	Phone Number
POST	PostCode	Character	4.0	10.0	Post Code
TEL	Phone	Character	8.0	20.0	Phone number
TITLE	Title	Character	10.0	50.0	
URL	URL	Character	30.0	256.0	
WEB	URL	Character	30.0	256.0	Web Site / Internet Address
ZIP	PostCode	Character	6.0	10.0	ZIP code

The user can review, refine and add to the shipped ‘Search Criteria’ values in order to better match the database field definitions.

The interface has an option to add new Search Words. X-Sanitize has its internal Data Type which the user can specify against the new Search Word so as to group similar types of data together and to assign meaningful data to the field when replacing data.



The valid Data Types are:

AD = Address

PC = Post Code

TN = Telephone Number

NM = Complete Name

N1 = First Name

SN = Last Name (Surname)

TT = Title, Salutation

ON = Organization

PN = Part Name

EM = Email

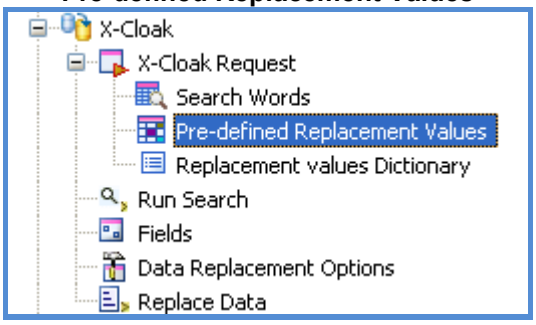
WW = URL

AB = Abbreviation

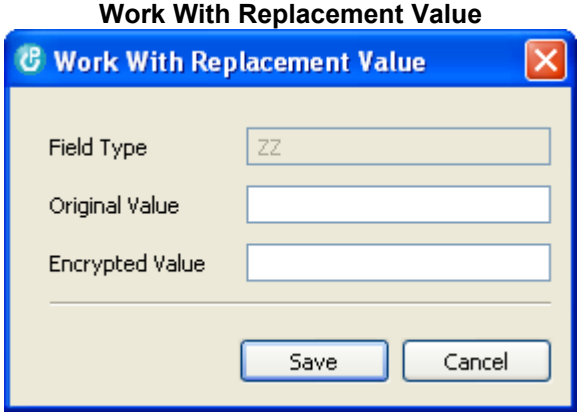
ID = Key Field

X-Sanitize provides a special feature called 'Pre-defined Replacement Values'. Here, the user can define replacement value for one or more words irrespective of the search word criteria for the complete application.

Pre-defined Replacement Values

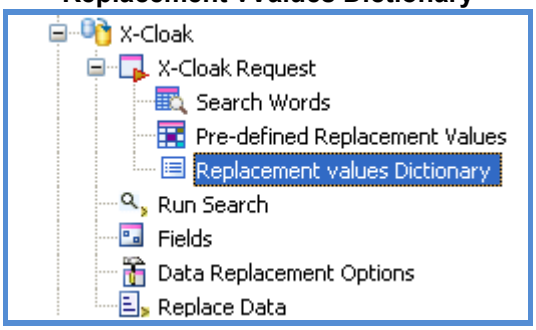


Work With Replacement Value



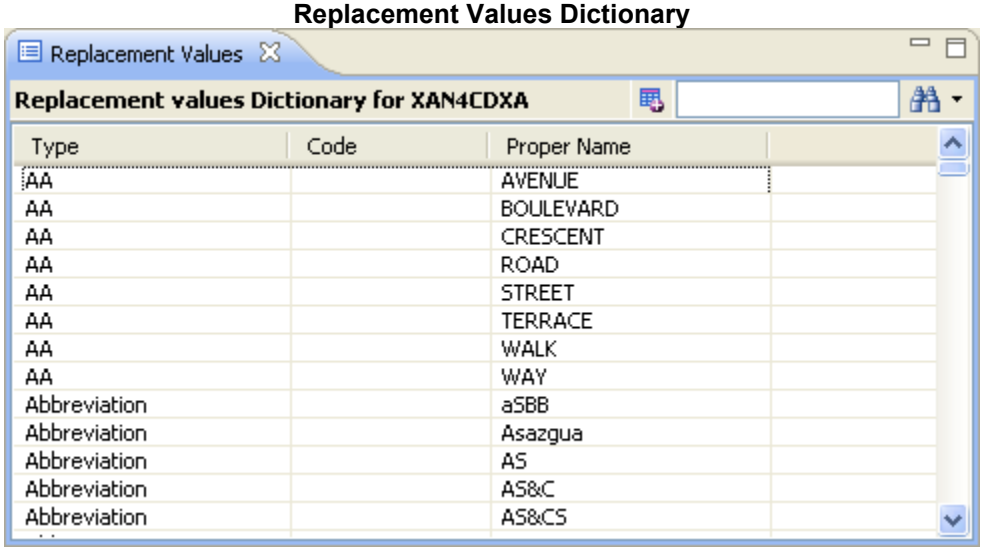
It also has the ‘Replacement Values Dictionary’ feature.

Replacement vValues Dictionary



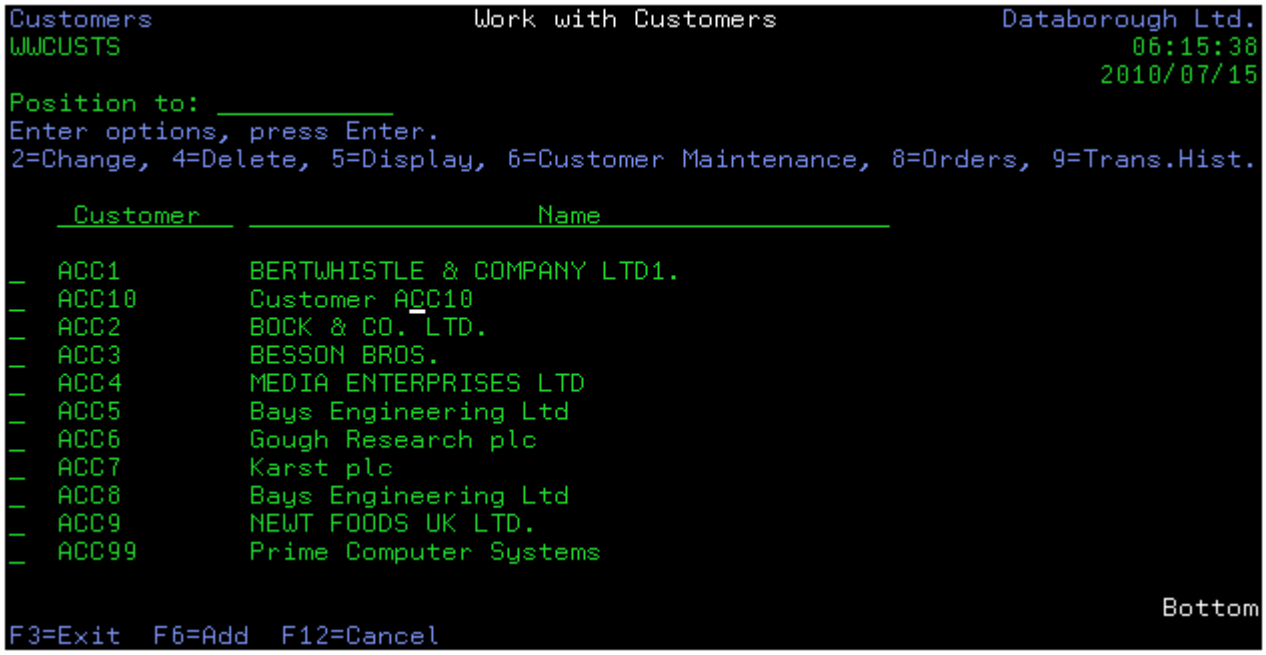
This feature processes all the files in the library defined as the ‘Data Library to Analyze’ looking for pieces of data that can be extracted to serve as replacement data. The Data is ‘cut into pieces’, assigned an X-Sanitize Data type and stored as a replacement values.

Replacement Values Dictionary

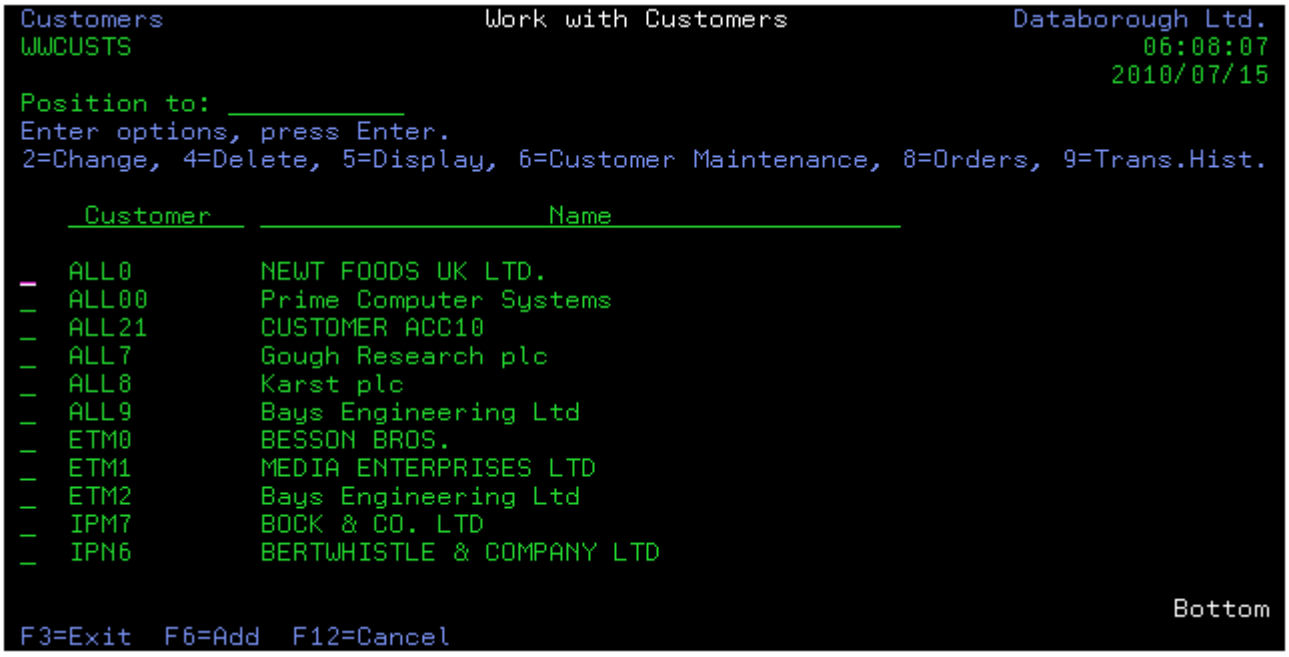


The user can add a new replacement value, if desired.

The following screens show what the data scrambling does to the ‘Customer’ field.



The screen above displays the original data which is to be scrambled. The screen below displays scrambled data instead of original data for the 'Customer' field.

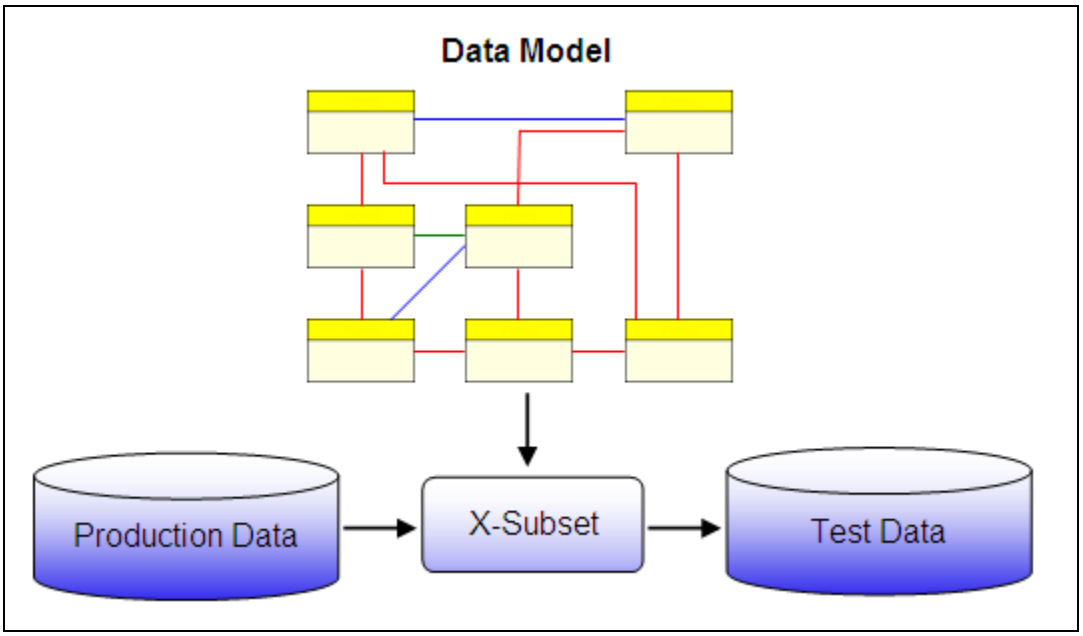


The intelligent data scrambling techniques puts to rest the possibilities of any legal action and embarrassment.

Create relationally coherent test data subsets from live data

The tool allows for an efficient and reusable way of creating and extracting test data subsets from the live database. The test data subsets are based upon user-specified selection criteria.

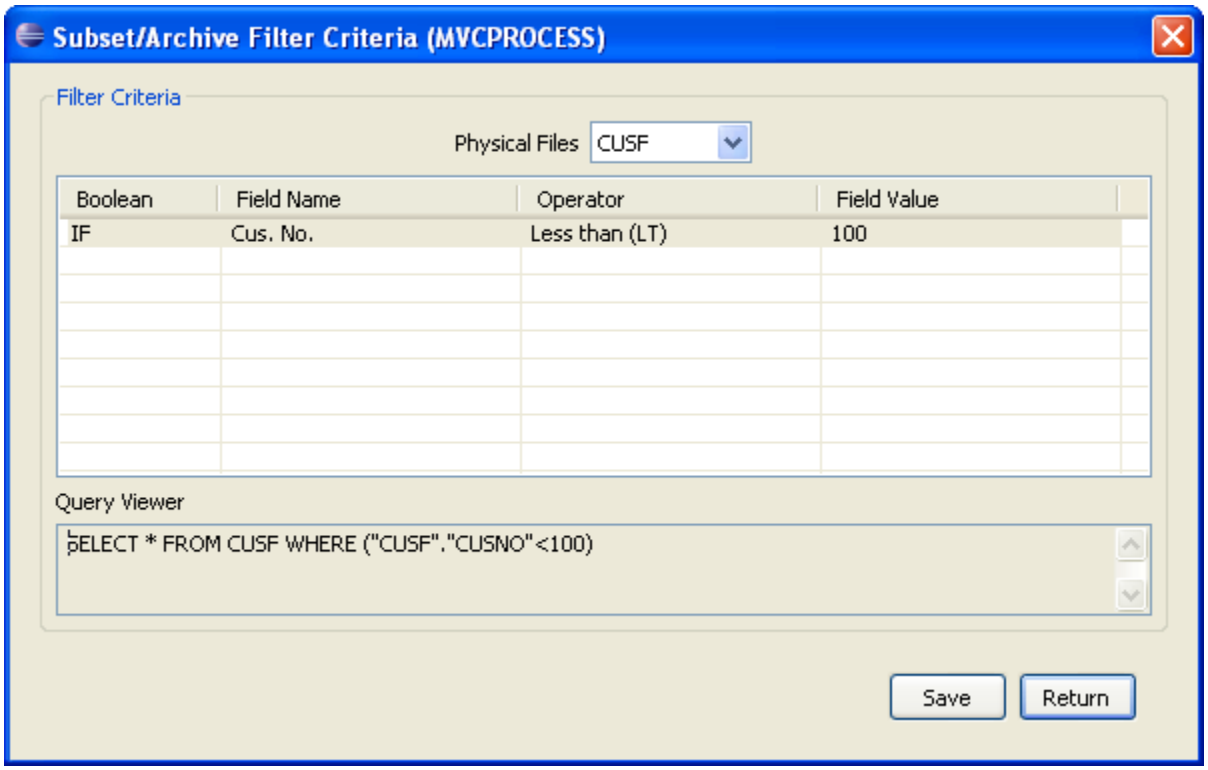
In order to guarantee coherent test data and ensure that the test data abides and cover all the business rules, X-Data relies on the companion product X-Analysis. The relational data model recovered by the X-Analysis is used to include all the related records from the related files in the production system, thus satisfying all the constraints of the data model.



The data model also ensures that X-Sanitize does not obfuscate the primary key data – instead it replaces keys throughout the test database in a consistent manner. It is therefore possible to produce multiple datasets for testing using the sophisticated and intelligent user interface.

The user-friendly interface allows the user to specify the filter criteria to generate the data subset to suit the test environment. Right from picking up the Physical File/Table to work with to specifying the field, the operator and the value can be easily done.

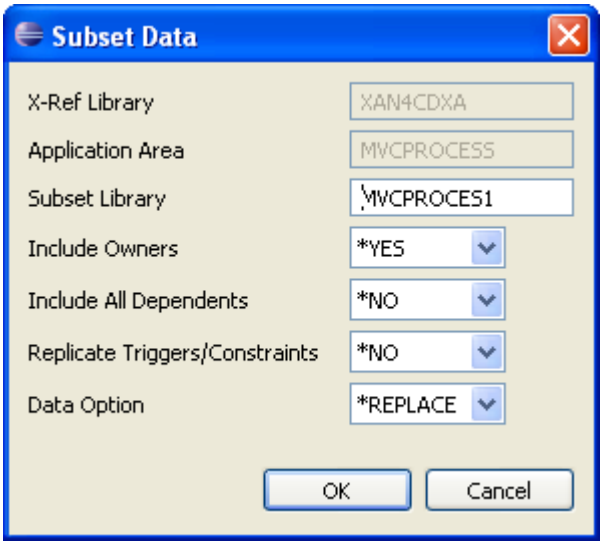
Setting up Filter Criteria



The Query Viewer section displays the query formed on the basis of the filter criteria specified.

The interface allows to further fine-tune the subset data by excluding/including the owning/dependent files. The process creates a subset library where the objects as per the existing application data model are included along with the complete test data subset from the live data. It first takes a specified number of records from each client file and then examines each data modelling relationship in turn to check that all referenced records are also included.

Setting up Filter Criteria

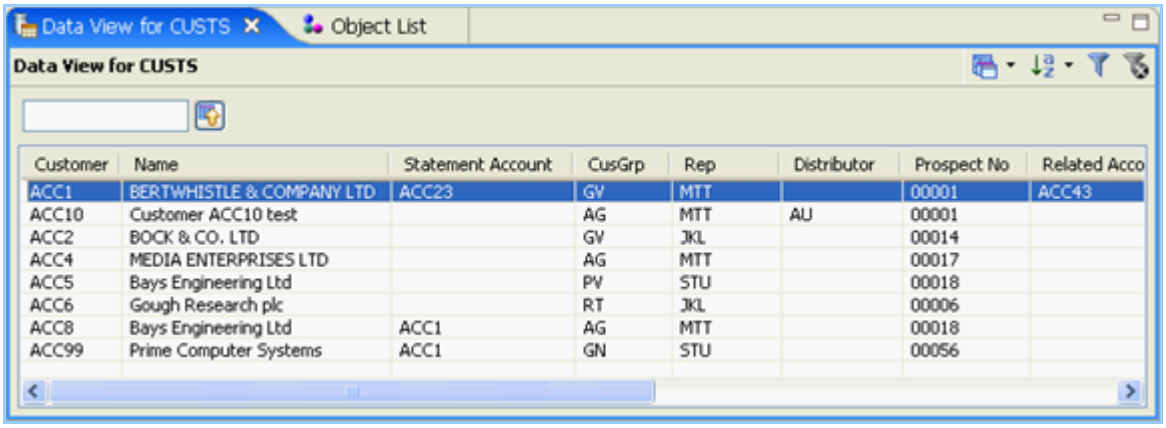


The process also creates the Subset library which keeps a copy of all the tables meeting the referential integrity with the obfuscated data. The user can select the subset library and work with the objects and data they contain.

The user, for example, can analyze the data model for the particular file, say 'PROTRK' and discover that 'PRODFT' and 'PROJECT' are related files. The user shall notice that the tool not only subsets the data for 'PROTRK' but also for the related files 'PRODFT' and 'PROJECT'.

The user can view the subset data in the subset library by including the subset library, listing the files under it and opting for ‘View Data’ option on the desired file.

Data view showing subset records



Customer	Name	Statement Account	CusGrp	Rep	Distributor	Prospect No	Related Acco
ACC1	BERTWHISTLE & COMPANY LTD	ACC23	GV	MTT		00001	ACC43
ACC10	Customer ACC10 test		AG	MTT	AU	00001	
ACC2	BOCK & CO. LTD		GV	JKL		00014	
ACC4	MEDIA ENTERPRISES LTD		AG	MTT		00017	
ACC5	Bays Engineering Ltd		PV	STU		00018	
ACC6	Gough Research plc		RT	JKL		00006	
ACC8	Bays Engineering Ltd	ACC1	AG	MTT		00018	
ACC99	Prime Computer Systems	ACC1	GN	STU		00056	

Verify Data Relationships

The Data Management Options allow the user to verify the data relationships. It examines each data record in turn to see if referential integrity is satisfied. Each integrity relationship that is breached is separately reported on in a comprehensive audit print produced by the product.

The Verification report displays the primary and the foreign key(s) of each record that breaches a given relationship. The report shown below is for an application area. Here, all the verified relationships are displayed in blue and the orphaned records are displayed in red.

Verification Report

Orphaned Records

Orphaned Records Report For Subset Data Library MVCPROCESS

File/Owner	Total	Primary Key	Foreign Key
CUSTS	0		
CUSF	0		
CUSGRP	0		
DISTS	0		
SLMEN	0		
		Relationship verified.	
CONDET	9		
CONHDR	5		
		XWORDN-XWABCD:3-000080	XWORDN:3
		XWORDN-XWABCD:4-000083	XWORDN:4
		XWORDN-XWABCD:5-000031	XWORDN:5
		XWORDN-XWABCD:5-000083	XWORDN:5
		XWORDN-XWABCD:7-000083	XWORDN:7
STKBAL	4		
STKMAS	0		
STOMAS	0		
TRNTYP	0		
STKBAL	0		
CONHDR	0		
CUSF	0		
TRNHST	10		

Deriving Legacy Data Model & Business Rules

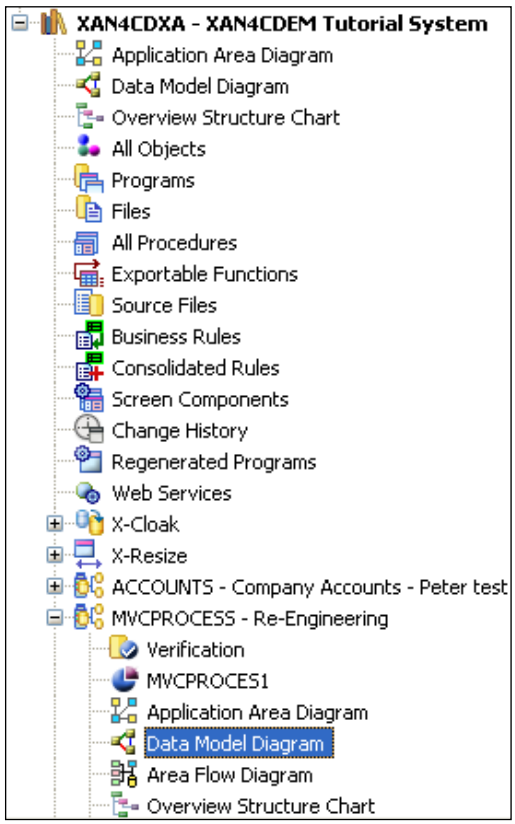
The relational model of an enterprise application and the business rules embedded in the program logic are the extremely powerful piece of information and potentially the valuable assets to the organization. For almost all RPG or COBOL applications running on IBM i, there is no explicit data model or schema defined.

By the term model, we are referring to the foreign key or relational model, not just the physical model of the database.

The X-Analysis Modelling toolset accomplishes the task of extracting the Data Model by analyzing the data structures of the physical and logical files, but it then programmatically traces these through all programs that use them to verify the existence of any cross-file relationships or foreign keys. These derived relationships can also be verified by the product by performing an integrity check on the actual data. This ensures that the data of the dependent file makes a reference to data records from the owning file. In this way, the automated modelling process can fully extract the data model from even the most complex legacy system.

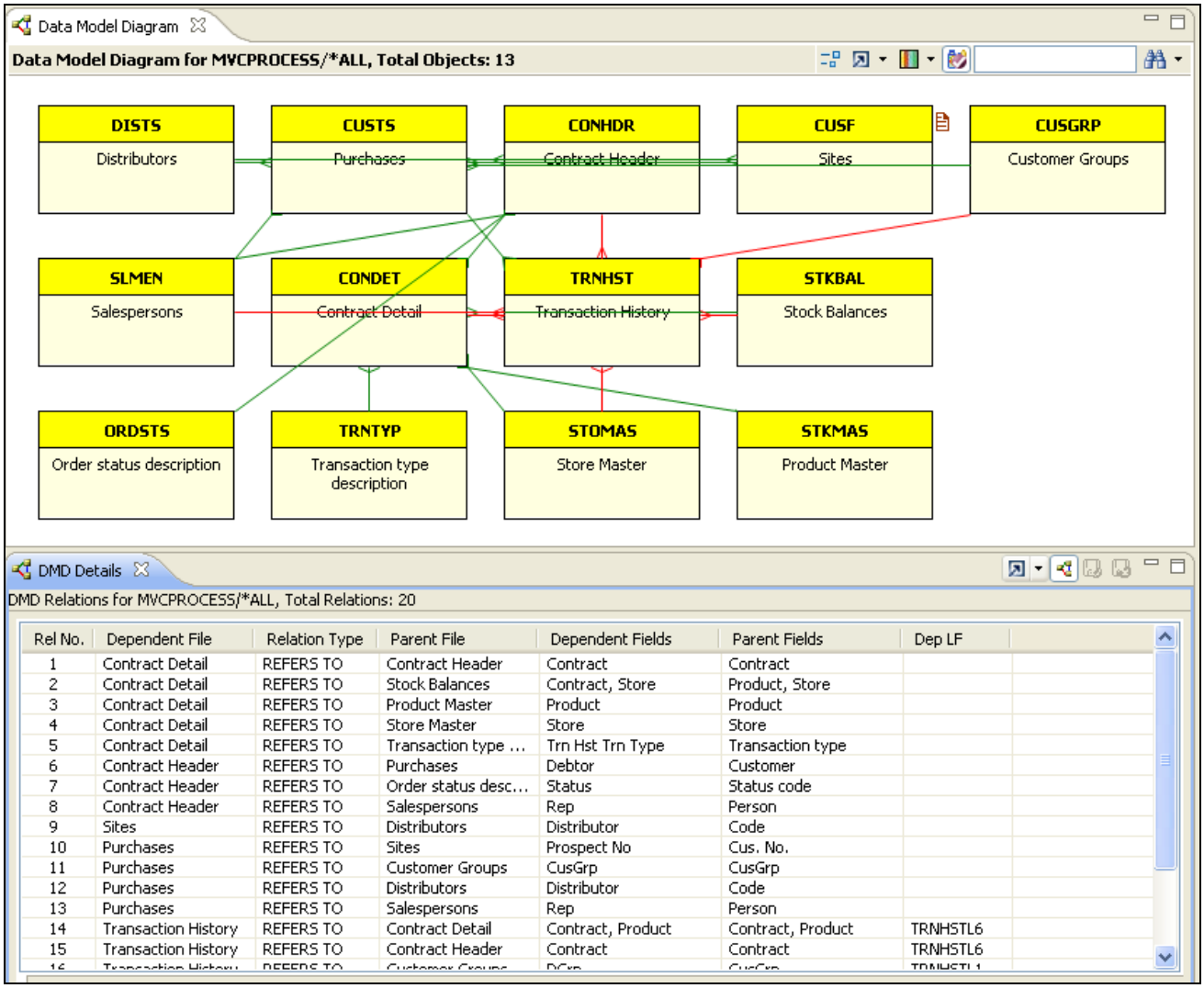
Entity Relationship Data Model Diagrams

The Data Model Diagram is the heart of the data modelling process and is done when all the primary identifiers have been found and the data dictionary has been built. The Data Model Diagram displays the file relationships for an individual file, entire application or application area. The related members are displayed distinctly in yellow.



On X-Analysis, the Data Model Diagram node under cross-reference / application area can be double-clicked to produce the diagram.

Data model Diagram



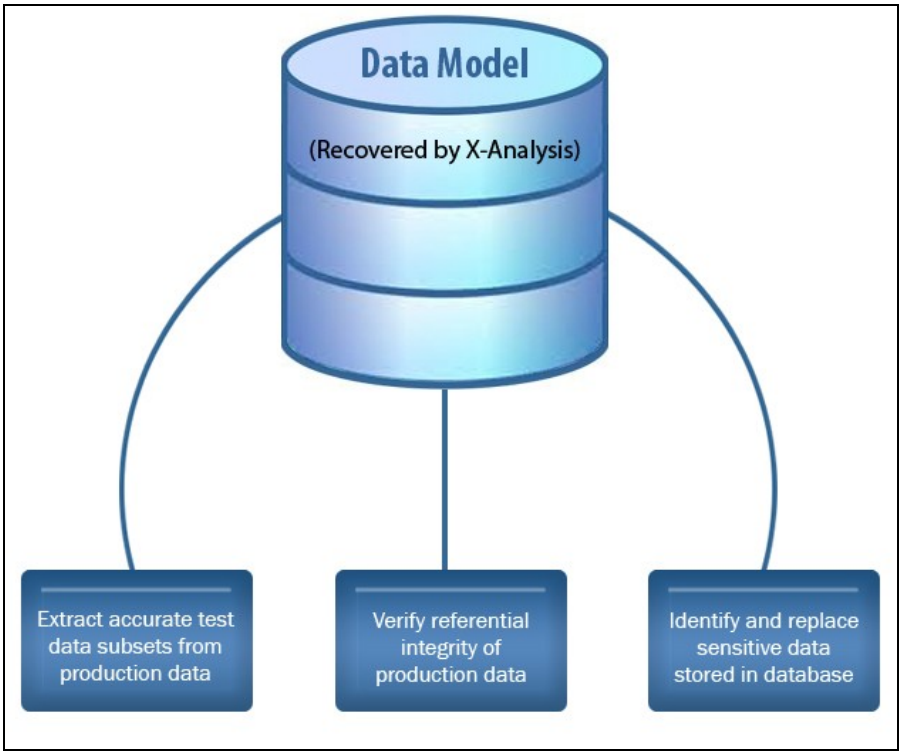
Rel No.	Dependent File	Relation Type	Parent File	Dependent Fields	Parent Fields	Dep LF
1	Contract Detail	REFERS TO	Contract Header	Contract	Contract	
2	Contract Detail	REFERS TO	Stock Balances	Contract, Store	Product, Store	
3	Contract Detail	REFERS TO	Product Master	Product	Product	
4	Contract Detail	REFERS TO	Store Master	Store	Store	
5	Contract Detail	REFERS TO	Transaction type ...	Trn Hst Trn Type	Transaction type	
6	Contract Header	REFERS TO	Purchases	Debtor	Customer	
7	Contract Header	REFERS TO	Order status desc...	Status	Status code	
8	Contract Header	REFERS TO	Salespersons	Rep	Person	
9	Sites	REFERS TO	Distributors	Distributor	Code	
10	Purchases	REFERS TO	Sites	Prospect No	Cus. No.	
11	Purchases	REFERS TO	Customer Groups	CusGrp	CusGrp	
12	Purchases	REFERS TO	Distributors	Distributor	Code	
13	Purchases	REFERS TO	Salespersons	Rep	Person	
14	Transaction History	REFERS TO	Contract Detail	Contract, Product	Contract, Product	TRNHSTL6
15	Transaction History	REFERS TO	Contract Header	Contract	Contract	TRNHSTL6

A complete data model accurately describing all possible relationships between each file is essential for productive maintenance and development work. Such a model also provides the foundation upon which critical data administration tasks such as referential integrity testing, test data extraction and data scrambling can be automated.

X-Data leverages this deep and extensive knowledge of the application's data model recovered by the X-Analysis to:

- Create complete test data subsets from live data.
- Verify and report on referential integrity of the entire live data.
- Identify and replace the sensitive data.

Data Model usage



Extracting Business Rules

The X-Analysis Application Discovery toolset accomplishes the task of extracting the embedded business rules. Through proprietary static analysis algorithms, it automatically extracts, cross-references and stores the business rules implemented in your applications.

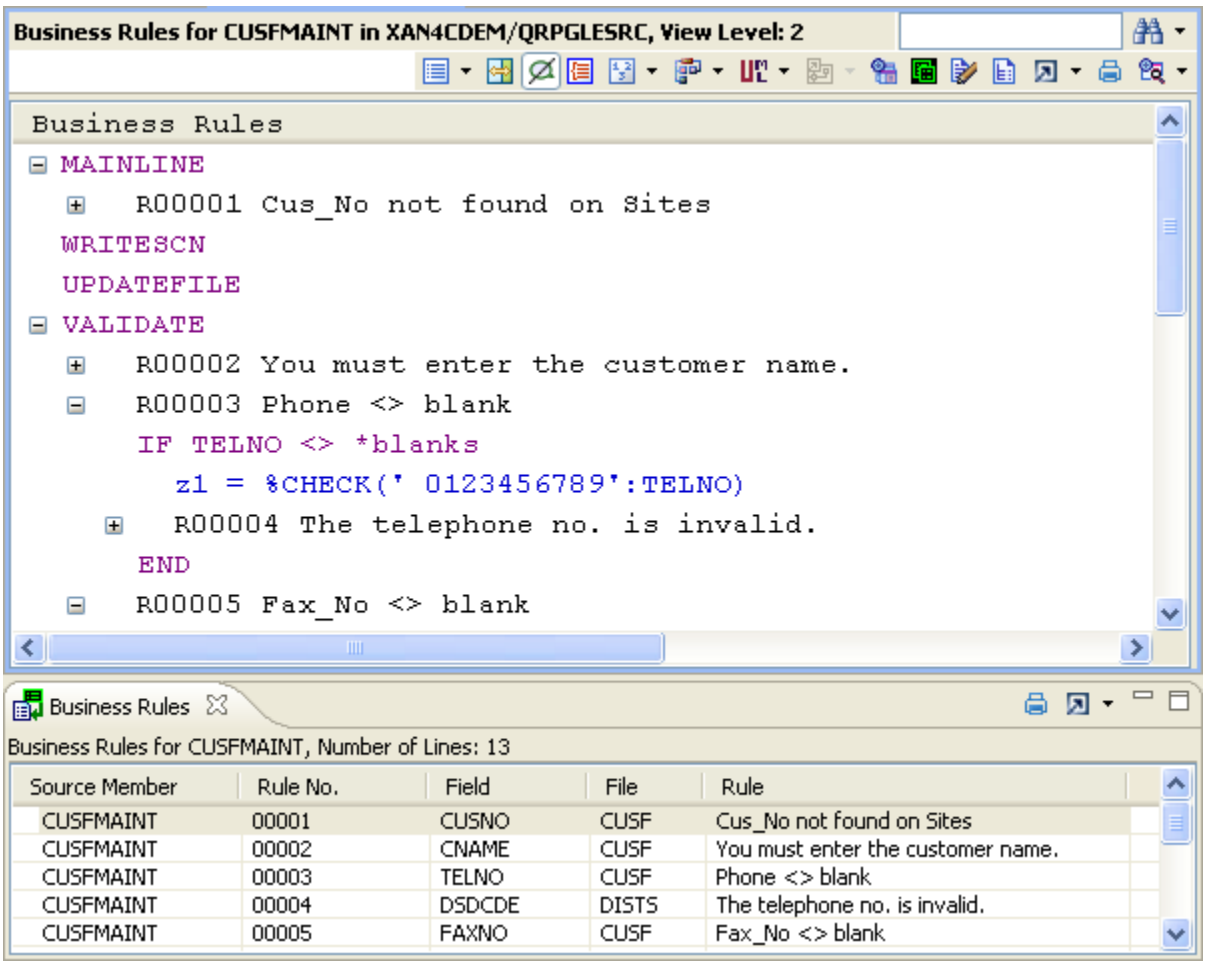
The program source is grouped into discreet blocks of logic so that each block represents a particular execution of a business rule. This block of code is then converted to 'Pseudo Code' that describes the execution of the logic. Literals and constants are used where possible in the narration giving very accurate descriptions of the logic. Each rule has a unique identifier that makes system wide analysis and documentation of business rules possible in the X-Analysis.

The entire process is achieved by invoking a single command on the X-Analysis. The business rule generation process identifies the various components of the business rules and writes them to either:

- A new source member
- An index over the original source member

Business Rules are generated for RPG, RPGLE and CBL programs. The interface allows the user to display the recovered business rules.

Business Rules recovered for a program



Building a repository of business rules saves valuable time in creating valid test data. It

- Facilitates analysis and portability of business logic
- Makes business logic more accessible to end users and business analysts
- Assists in covering the test scenarios with optimal test data

Summary

Setting up a test environment for an effective and accurate Software testing is an essential requirement to deliver a Quality product. The strategy to achieve this requires accurate and valid data without compromising with the privacy laws and giving consistent test results. These demanding and time-consuming requirements often lead to a reticence in this area. The X-Data is a dedicated tool for the job, which automates the process of setting up these requirements and managing them seamlessly.

About Us

Behind everything we do is the belief that legacy systems contain tremendous value, not just in the past, but for today and tomorrow as well.

We believe in starting with what has been proven to work. What works in AS/400 - IBM i IT shops are legacy systems, developed and tested through many years of use.

We take those legacy systems and analyze them, parse them, sort them, index them, translate them. We build them into a repository of many dimensions and many views and many outputs.

A repository that reflects your intelligence and your efforts of decades of development, representing thousands to millions of dollars of investment.

We create products that make your system more:

- Accessible
- Understandable
- Usable
- And ultimately, more valuable to your company

We do this for your purposes of:

- Application maintenance and analysis
- Rewriting, modernization and reengineering
- Package acquisition and gap analysis

25 Years of Continuous Development in Response to Customer Needs

What started as a cross-reference tool in the 1980's has evolved into an extensive suite of needs-driven tools and a full scale reengineering system for RPG, COBOL and CA:2E applications.

The X-Analysis repository has grown over the years to contain hundreds of internal analytical tables and many hundreds of proven static analysis and reengineering programs.

We pride ourselves on our commitment to the continuing extension and improvement of our products, making us one of the few major ISV's in the IBM i market to continue to do so at full scale and speed.