

X-2E ANALYSIS

A Complete Tool for Automated Graphical Documentation, Impact Analysis, Application Process Mapping and Audit, Quality and Change Management for CA 2E Applications on IBM i

What's Inside

A description of X-2E Analysis, the complete Fresche Legacy tool for analysis of CA 2E applications. X-2E Analysis provides automated and interactive analysis, documentation and impact analysis; extracts business rules; and creates audit, code quality and change management reports for CA 2E applications on IBM i.



X-2E Analysis

Sharing valuable CA 2E Application Design Knowledge

The knowledge and information represented by your organization's business software design and metrics has been accumulated over many years and is extremely valuable. In the case of CA 2E applications, this design model is often out of reach to all except CA 2E developers. By recovering and sharing existing, proven business logic and data and process models that represent years of investment and development, IT organizations lower cost, time and risk for all types of projects that enhance or replace their legacy applications:

- ▶ Ongoing maintenance and enhancement
- ▶ Reengineering and rewriting projects
- ▶ Replacement projects that use off the shelf packages.

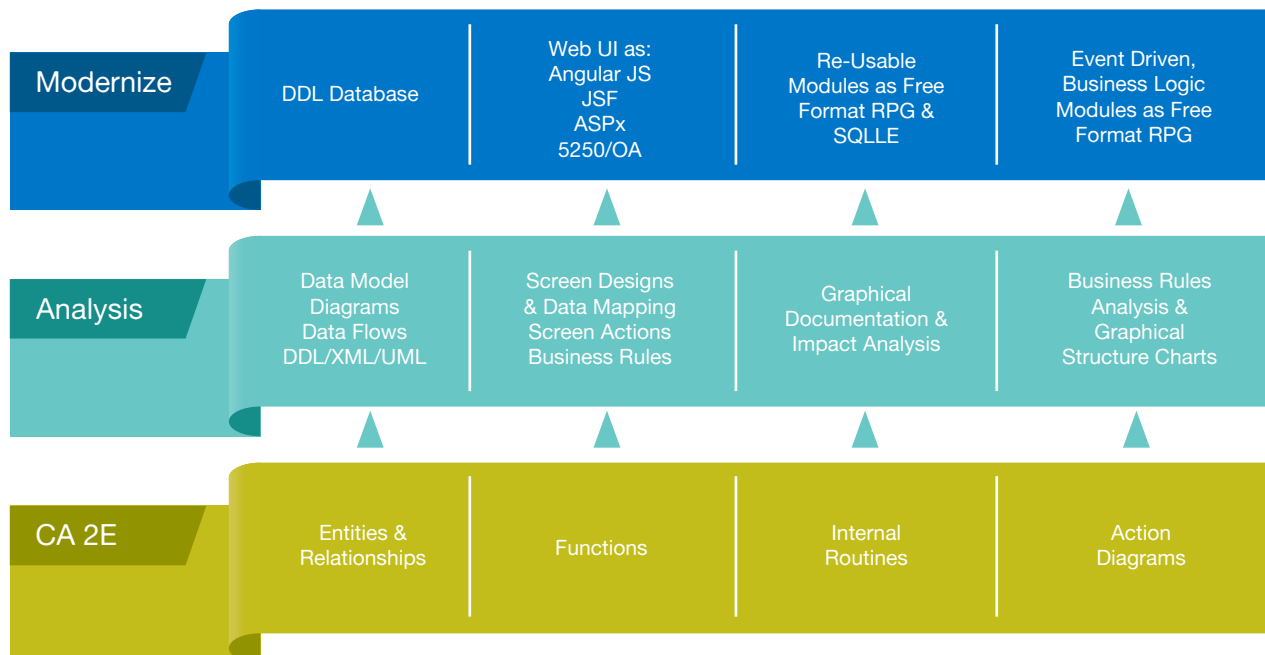
The more design and metrics information you recover and share, the more successful you will be at lowering your costs, timelines and risks for such projects and tasks. X-2E Analysis is unique in that it extracts the complete design from the CA 2E model and presents it in an interactive and graphical analysis tool. The rich pedigree of the underpinning X-Analysis technology adds another value in allowing seamless impact analysis and graphical documentation of hand-coded RPG, Cobol, CL, Java, C# and PHP alongside CA 2E designs and code.

The X-2E Analysis repository also underpins key automated modernization features such as database, business logic, and UI modernization embedded in other Fresche Legacy tools.



X-2E Analysis:
Automated documentation, impact analysis, business rule extraction, and audit, quality and change management

- ▶ Complete extraction of CA 2E Model: Entity Model; Functions; Action Diagrams; Internal Routines; Application Areas
- ▶ Interactive documentation as ERD of relational data model from CA 2E Model and hand-coded DDS
- ▶ Interactive documentation of Action Diagram User Exits
- ▶ Interactive documentation and where used of Internal Routines
- ▶ Interface diagramming between Application Areas
- ▶ Seamless integration of documentation and impact analysis between Action Diagrams and hand-coded RPG/Cobol/Java/PHP/C#
- ▶ Long/short name Variable Tracing – Rich drill downs through layers in Action Diagrams, DDS, DDL, Functions, RPG, COBOL, CL, SQL
- ▶ MS Word/Open Office/Excel documentation wizards
- ▶ Identification and documentation of business rule logic from 2E Action Diagrams
- ▶ Consolidation and cross referencing of Action Diagram business rules to entities and fields
- ▶ Business rule annotation, 'where used', auditing, and summaries
- ▶ Program, screen and data entity metrics
- ▶ Problem analysis for design oddities, such as unused elements and application level difference analysis... and much more...



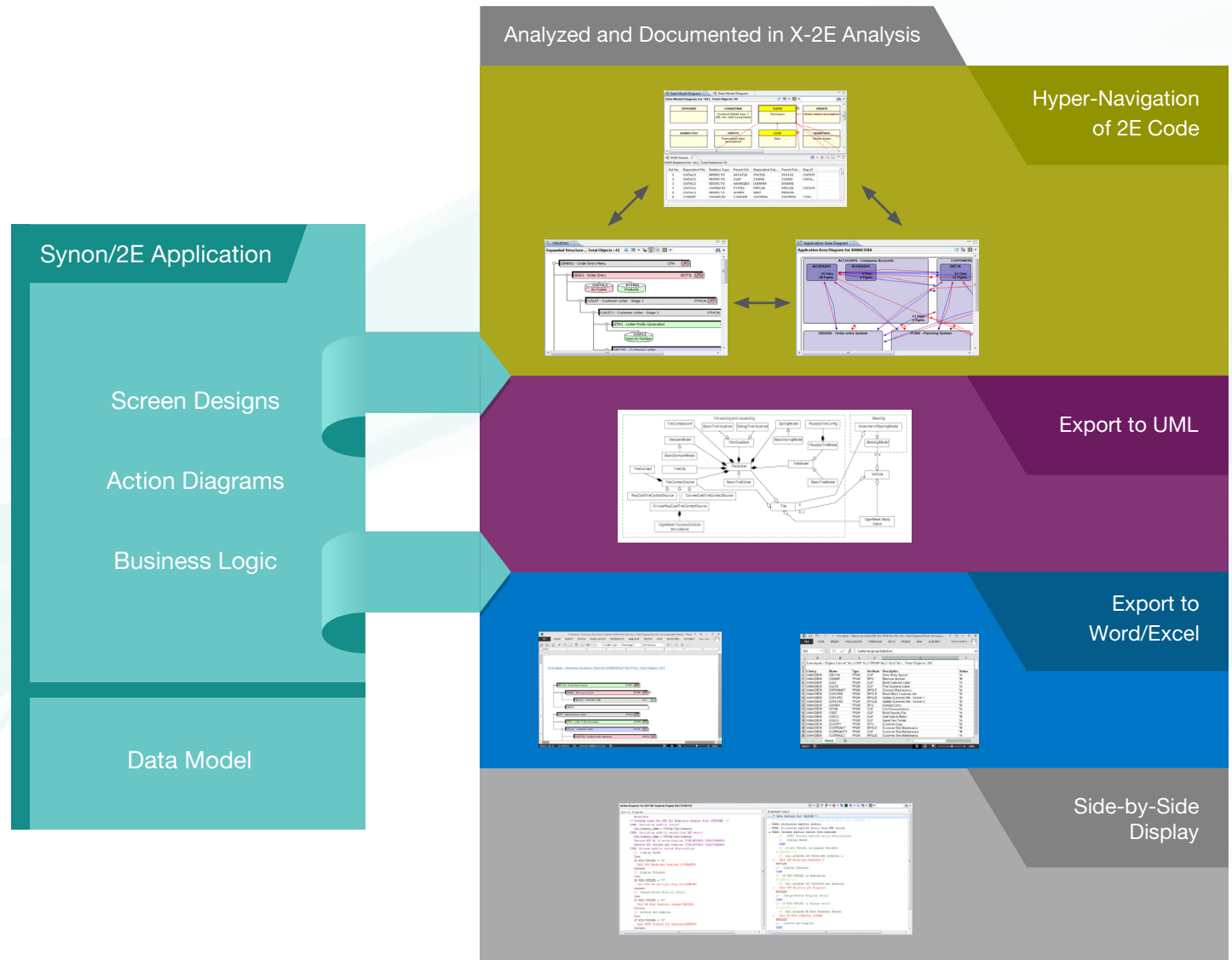
Introducing X-2E Analysis

Powerful Tool for Complete Extraction, Analysis and Documentation of CA 2E Model Architecture

CA 2E developers implement business requirements and design into four separate layers:

- ▶ Functions (User Interface)
- ▶ Internal Routines (IO and Business Methods)
- ▶ Action Diagrams (Business Rules/Logic)
- ▶ Entities (Relational Data Model)

X-2E Analysis extracts, analyses and documents this CA 2E model architecture automatically. It does this visually and interactively using ERDs, screen flows, business rules, UI designs, metrics, complexities, data flows, Impact analysis and much more. With little effort and time all stakeholders (not just 2E experts) can easily assess the design and relevance of the CA 2E application.



Entity Relational Model Analysis

The cornerstone of a CA 2E Application is its Entity Model. X-2E Analysis extracts this model automatically from the CA 2E Model.

This can then be analyzed, indexed, exported and visualized in interactive diagrams such as Data Model Diagrams.

X-2E Analysis provides an interactive data dictionary, diagramming and export facilities that include:

- ▶ Entities (Physical files and SQL/DDL Tables)
- ▶ Field Details – including long names and headings
- ▶ Access Paths/Logical Files
- ▶ All Foreign Key Relationships from the CA 2E Model and derived from hand-coded DDS/RPG/Cobol
- ▶ Complete description text of foreign key relationships, describing parent-child relationship join rules
- ▶ Entity relationship diagrams
- ▶ Visio exports for graphical diagrams
- ▶ Browsing and analysis of data dictionary
- ▶ Drill down into actual file/table data from diagrams

The screenshot displays the X-2E Analysis software interface with several key components:

- Object List for *ALLUSR/T*/FILE/PF/*ALL/*ALL, Total Objects: 10**: A table listing various physical files and their attributes.
- File Field Details for X2EGEN/TSACREP, Total Fields: 10**: A table detailing the fields of the TSACREP file, including Mnemonic, Long Name, Type, Length, Inp.B..., and Headings.
- Data Model Diagram for HOSPCHG/*ALL, Total Objects: 9**: A graphical diagram showing relationships between entities like TSAHCPP, TSAICPP, TSADREP, TSAGCPP, TSAFREP, TSAEREP, TSAJREP, TSACREP, and TSAKCPP.
- DMD Relations for HOSPCHG/*ALL, Total Relations: 11**: A table showing relationships between dependent files and parent files.
- Access Path Diagram for TSACREP, Total Objects: 4**: A diagram showing the access paths for the TSACREP file, including TSACRELO, TSACREL1, and TSACREL2.
- Data View for TSACRELO**: A table showing the data for the TSACRELO file, including Hospital Code, Hospital Name, Country, Address Street, and Address.

Library	Name	Type	Attribute	Description	Status	Changed	Created	Used
PF X2EGEN	TPRSNCNTCT	*FILE	PF	Person to contact physical file	*D	14/02/14	07/10/13	22/04/14
PF X2EGEN	TSACREP	*FILE	PF	Hospital Physical file	*A			
PF X2EGEN	TSADREP	*FILE	PF	Ward Physical file	*B			
PF X2EGEN	TSAEREP	*FILE	PF	Patient Physical file	*B			
PF X2EGEN	TSAFREP	*FILE	PF	Doctor Physical file	*B			
PF X2EGEN	TSAGCPP	*FILE	PF	Diagnosis Physical file	*B			
PF X2EGEN	TSAHCPP	*FILE	PF	Prescription Physical file	*B			
PF X2EGEN	TSAICPP	*FILE	PF	Prescription Line Physical file	*C			

Mnemonic	Long Name	Type	Length	Inp.B...	Headings
ACADCD	Hospital_Code	CHAR	00006	00001	Hospital Code
ACAETX	Hospital_Name	CHAR	00025	00007	Hospital Name
ACAFTX	Address_Street	CHAR	00025	00032	Address Street
ACAGTX	Address_Town	CHAR	00025	00057	Address Town
ACAHTX	Address_Province	CHAR	00025	00082	Address Province

Rel No.	Dependent File	Relation Type	Dependent Fields	Parent Fields
1	Ward Physical file	OWNED BY	Hospital Code	Hospital Code
2	Patient Physical file	REFERS TO	Hospital Code, Ward Code	Hospital Code, Ward Code
3	Doctor Physical file	REFERS TO	Hospital Code	Hospital Code
4	Doctor Physical file	REFERS TO	Hospital Code	Hospital Code
5	Diagnosis Physical file	OWNED BY	Patient	Patient
6	Diagnosis Physical file	REFERS TO	Doctor	Doctor

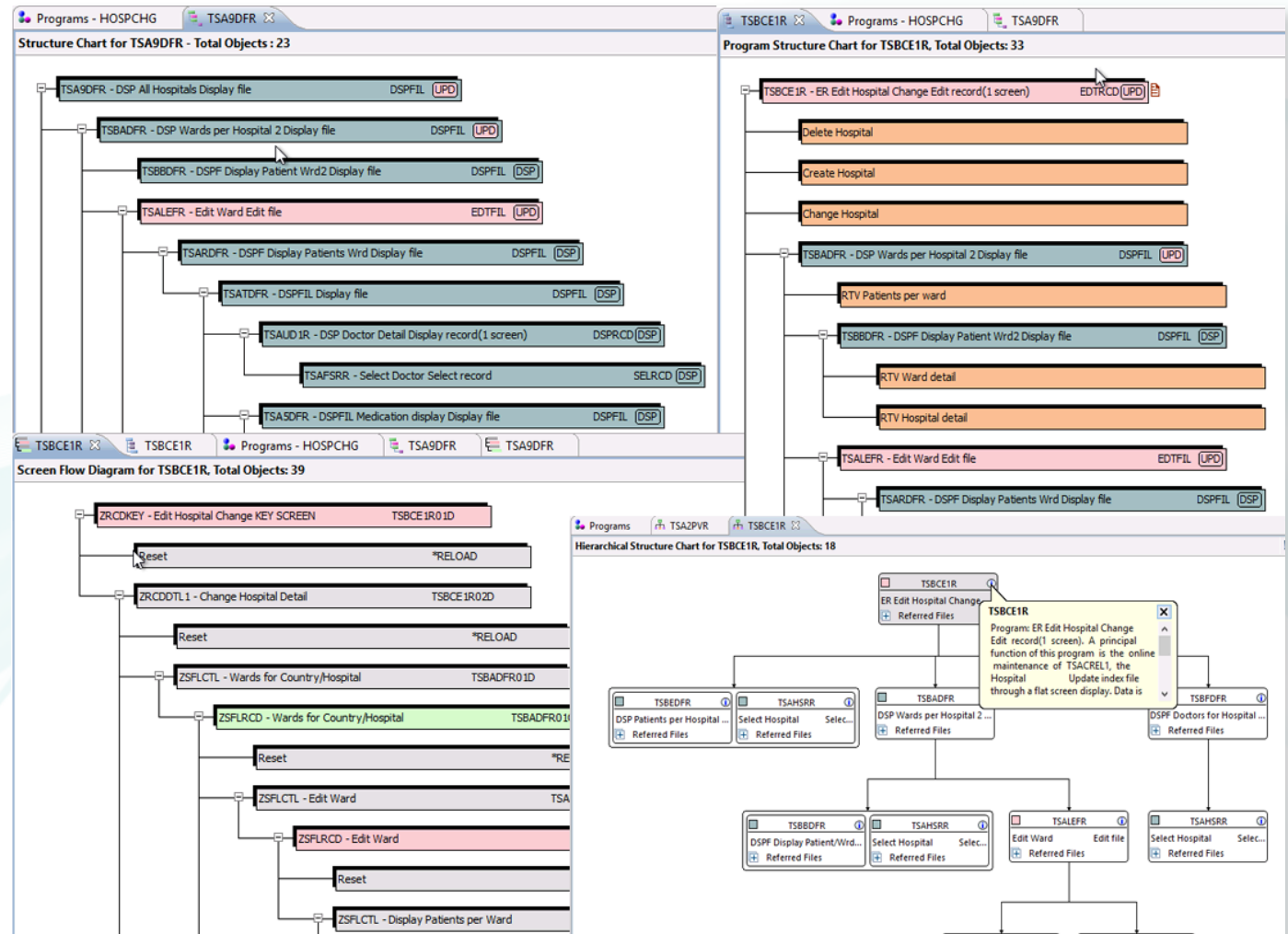
Hospital Code	Hospital Name	Country	Address Street	Address
HOSP1	General Hospital	UK	11 High Street	Manche
HOSP12	Ford Hospital	USA	Burlington	Luckno
HOSP2	Blue Cross Hospital	USA	7th Street1	New Yo
HOSP3	St. Mary's Hospital	GER	St. Peter Road	Kursi Rd
HOSP4	Fortis Hospital	USA	Saint Road1	
HOSP6	Apollo Hospital	USA		
HOSP7	Mother Teresa Hospital	USA	Hello	ABCD
HOSP8	NEW Hospital	RSA	ABDC	sfjdkd
000005	St Stuarts	USA	3456 5th Avenue	Manhattan New York

Functional Analysis - Interactive Structure Diagrams

CA 2E uses a powerful CASE concept to allow designs to be implemented very productively. For documentation, users must still rely upon text-rich descriptions of code and structure. Rather than very long printed reports to understand application design and structure, X-2E Analysis uses modern, interactive, color-coded graphical diagrams. This allows new CA 2E developers and non-2E developers alike to understand and navigate their way through the application architecture efficiently and effectively. All diagrams and objects can be annotated, and exported into Visio, Word, Open Office, Excel and PDF, making collaboration between developers, architects, DBAs and testers quick and easy. Functions and internal routines can be viewed in various structure diagrams that depict the flow and call structure of a function, an internal routine, a menu, or an external calling program.

The various interactive structure diagrams displayed in X-2E include:

- ▶ Structure Chart Diagram - shows call structure tree between functions and external programs
- ▶ Program Structure Chart - shows internal call structure of an action diagram including internal routine calls
- ▶ Screen Flow Diagram - shows interactive calls/flow between individual screen formats
- ▶ Hierarchical Structure Chart - call structure tree between functions and external programs as "bus-route" layout



Functional Analysis - Screen Display Documentation

X-2E Analysis extracts the complete function definition from the CA 2E Model. This definition can then be visualized, analyzed and documented in detail with Word, Open Office or PDF. It can also be exported as XML for reuse in other IDEs or tools during modernization efforts.

Some of the key function displays include:

- ▶ Layout – all formats displayed as seen by the user without the need to run the program
- ▶ Screen Fields – complete details of constants / labels / fields on the screen plus data source mapping by field
- ▶ Screen Actions – all calls or default actions / events triggered in the display with parameters passed for each event
- ▶ Data Content Diagram – mapping of all fields and work-fields and their data source, including any joins from related files

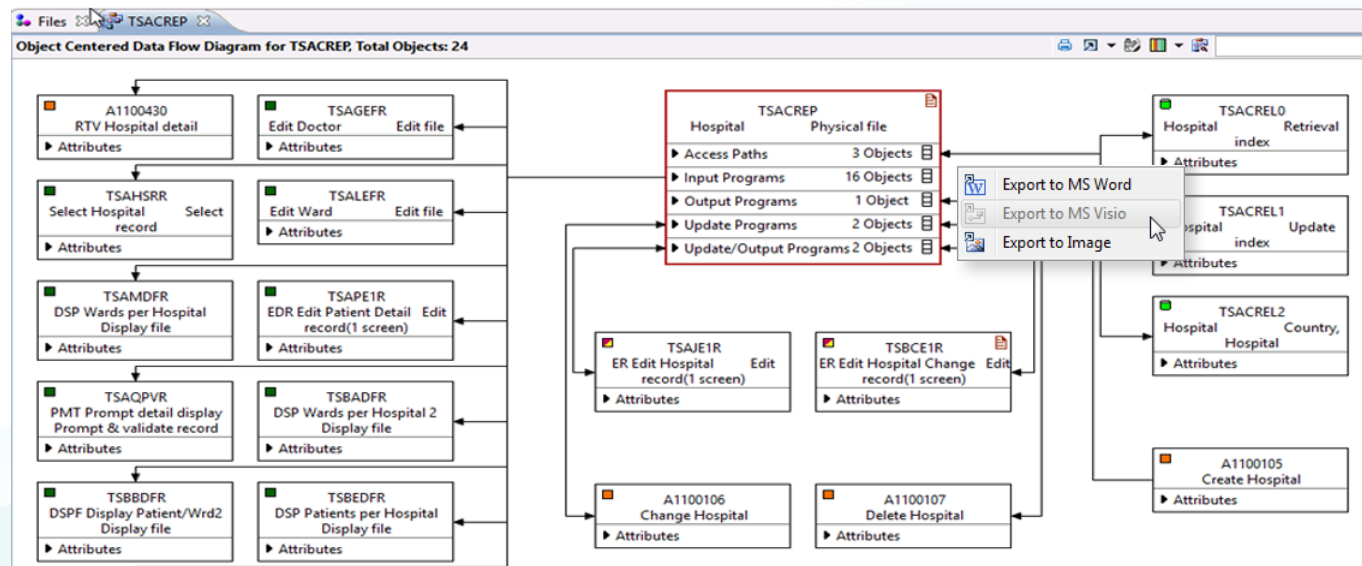
The screenshot displays four windows from the X-2E Analysis tool:

- Screen Design for TSAJE1RD - ZRCDDTL1:** Shows a terminal-style screen layout for 'Edit Hospital Details'. Fields include Hospital Code, Hospital Name, Street Address, Town, State/Prov/Count, Postal or Zip Code, Country, Telephone Number, and Fax Number. Control keys like F3=Exit, F4=Prompt, and F9=Change are listed at the bottom.
- Screen Action Diagram for TSAJE1R02D:** A tree view showing actions such as 'Exit', 'TSBADFR - Wards', 'TSBEDFR - Patients', and 'TSBFDFR - Doctors', each with associated data fields like Hospital_Code, Country, and Telephone_Number.
- Field details for TSAJE1R02D, Total Objects: 10:** A table mapping screen labels to system fields and attributes.

Label	Line	Column	Field	Key Type	File	Attribute
Hospital Code	4	32	Hospital_Code	K	TSACREP	Output
Hospital Name	6	32	Hospital_Name	D	TSACREP	Both
Street Address	7	32	Address_Street	*	TSACREP	Both
Town	8	32	Address_Town	*	TSACREP	Both
State/Prov/Count	9	32	Address_Province	*	TSACREP	Both
Postal or Zip Code	10	32	Address_Post_Zip	*	TSACREP	Both
Country	11	32	Country	H	TSACREP	Both
	11	37	Country_Name	Z	WorkField	Output
Telephone Number	12	32	Telephone_Number	*	TSACREP	Both
Fax Number	13	32	Fax_Number	*	TSACREP	Both
- Data Content Diagram for TSAJE1R02D:** A hierarchical diagram showing the data flow for the 'Hospital' physical file, including fields like Hospital_Code, Hospital_Name, Address_Street, and Country_Name, and their relationships to workfields.

Graphical Analysis - Data Flows

CA 2E has built-in 'where used' facilities. X-2E Analysis extends this functionality to allow visual and complete coverage of the code base for an application, including EXCURSRC and hand-coded source such as RPG/COBOL/Java/PHP/C#* in a single inquiry. Graphical Data Flow Diagrams in X-2E Analysis provide an interactive and intuitive way to understand, document, and hyper-navigate the flow of data in the application. The flow between functions, programs, internal routines, displays, entities, and displays are grouped and laid out appropriate to their relationship with any selected element. Color-coding speeds up key info recognition for more efficient analysis. Diagrams can be exported into Visio, Word, PDF, Open Office, or viewed as more traditional object 'where used' interactive lists and exported to Excel. The Data Flow Diagram also provides specific detail about how individual attributes of an element are used or flow with another. For example, a function uses an entity but only certain fields are actually being used in the action diagram or display.



Object Where Used - Usage References for TSACREP, Total Objects: 24

Object	Type	Attribute	Text	Usage	Library
A1100105	*INTRTN		Create Hospital	File Written To By Program	
A1100106	*INTRTN		Change Hospital	File Updated By Program	
A1100107	*INTRTN		Delete Hospital	File Updated By Program	
A1100430	*INTRTN		RTV Hospital detail	File Read By Program	
Hospital	*PGM	JAVA	Hospital	File Read By Program	C:\Users\US\
TSACRELO	*FILE	LF	Hospital Retrieval index	Logical File	X2GEN
TSACREL1	*FILE	LF	Hospital Update index	Logical File	X2GEN
TSACREL2	*FILE	LF	Hospital Country, Hospital	Logical File	X2GEN
TSAGEFR	*PGM	RPG	Edit Doctor Edit file	File Read By Program	X2GEN

- Access path
- Called
- Calling
- Input
- Internal routine
- Output
- Update

Some Highlights:

- ▶ Interactive graphical hyper-navigation where used
- ▶ Color coded for usage context
- ▶ Export to Visio, Word, Image
- ▶ View as interactive text list with export to Excel

* May require additional X-Analysis modules

Cross-System Impact Analysis

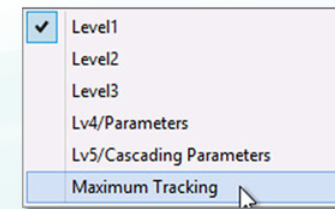
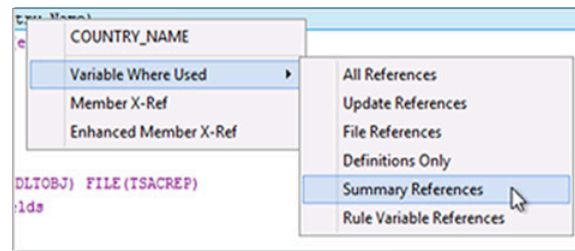
Field/Variable Impact Analysis is another key area where X-2E Analysis extends the built-in features of CA 2E. The X-Analysis repository that underpins the X-2E product maps all fields and variables across an entire application at the most detailed level possible, not just within the extracted CA 2E Model context. This can shorten analysis effort from weeks to seconds in extreme cases, providing a significant productivity advantage even in simple cases. Development quality and project estimation accuracy are also greatly improved.

Impact analysis can be triggered from any context or diagram within the X-2E product, and the output is both interactive and complete in its coverage of any impacted code, on or off the IBM i within or without the CA 2E application code base (RPG/Cobol/CL/Java/C#/PHP*).

The context of the results can be restricted to a specific application area. X-2E Analysis is unique in providing automated tracing through multiple iterations of variables throughout the code base, following assignments and associations with other variables fields, in a single inquiry.

Some highlights:

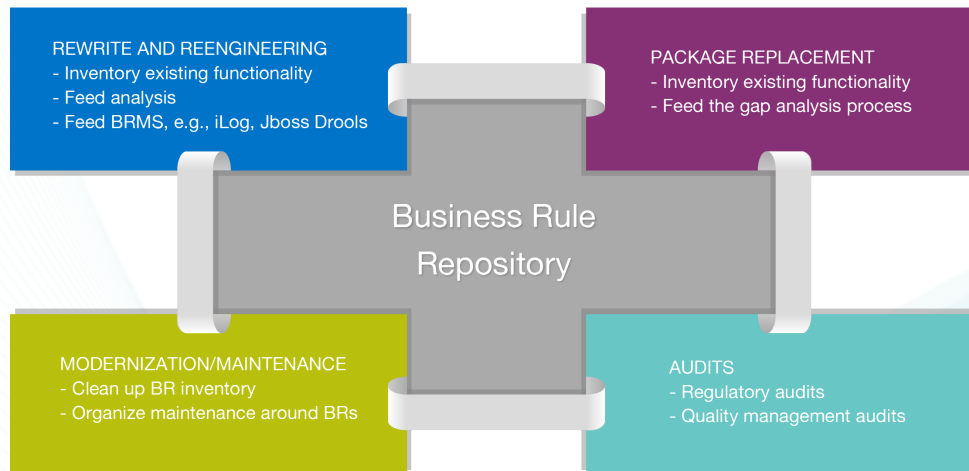
- ▶ Long/short name field where used
- ▶ Long/short name variable where used
- ▶ Restrict results to application area
- ▶ Expand through multiple levels of variable tracing
- ▶ Exports to Word, Excel, Open Office



Name	Long Name	Seq No	Code Snippet	Library
Hospital	Hospital	0138.0	@Column(name="ACAGST", length=3)	C:\Use
PmtHospita...	PmtHospitalsPerCountryPro...	0174.0	messages[z4].setMessageField("ACAGST");	C:\Use
PmtHospita...	PmtHospitalsPerCountryPro...	0068.0	@Column(name="ACAGST", length=3)	C:\Use
PmtPromptD...	PmtPromptDetailDisplayPro...	0074.0	@Column(name="ACAGST", length=3)	C:\Use
PmtTestBat...	PmtTestBatchFunctionPromp...	0066.0	@Column(name="ACAGST", length=3)	C:\Use
SelectHosp...	SelectHospitalSelectRecor...	0056.0	@Column(name="ACAGST", length=3)	C:\Use
SelectHosp...	SelectHospitalSelectRecor...	0067.0	@Column(name="ACAGST", length=3)	C:\Use
TSACREL0		0027.00	A ACAGST TEXT('Country')	X2EGEN
TSACREL1		0027.00	A ACAGST TEXT('Country')	X2EGEN
TSACREL2		0026.00	A ACAGST TEXT('Country')	X2EGEN
TSACREL2		0029.00	A K ACAGST	X2EGEN
TSACREP		0037.00	A ACAGST 3 TEXT('Country')	X2EGEN
TSAJE1R		0021.00	DIL.Country = RIVCND(DIL.Country_Name);	A_2ED
TSAJE1R		0047.00	IF DIL.Country = 'RSA';	A_2ED
TSAJE1R		0065.00	IF DIL.Country = 'UK';	A_2ED
TSAJE1R		0083.00	IF DIL.Country = 'USA';	A_2ED
TSAJE1R		0101.00	IF DIL.Country = 'CAN';	A_2ED
TSAJE1R		0133.00	PARAMETER(DIL.Country);	A_2ED
TSAJE1R		0146.00	PARAMETER(DIL.Country);	A_2ED

Business Rule Analysis and Documentation

Analysis and Documentation of Business Rules from CA 2E Code on IBM i



The X-2E Analysis Application Process Mapping functionality creates a highly structured repository of business rules written in easily readable pseudo code. This repository provides a basis for all ongoing activity: Rewriting and reengineering, package replacement analysis, modernization and maintenance, and all types of audits.

Some business rule documentation highlights in X-2E Analysis:

- ▶ Identifies and documents business rule logic from 2E Action Diagrams
- ▶ Provides analysis and cross referencing of business rule logic in legacy 2E Action Diagrams
- ▶ Permits individual business rule annotation
- ▶ Provides business rule status editing and reporting
- ▶ Specifies business rule 'Where Used' and provides summaries
- ▶ Creates business rule database
- ▶ Exports business rules to MS Word and EXCEL
- ▶ Provides business rules consolidation by:
 - ▶ Program
 - ▶ Table/Field
 - ▶ Display formats/Screens
- ▶ Displays business processes as Pseudo code
- ▶ And much more...

Your Business Rules Run the Company, but They're Hidden Deep in Your Code

Definitions of the term 'business rule' range from the highly theoretical to the immensely practical, but IBM commonly refers to business rules as: "anything that captures and implements business policies and practices. A rule can enforce business policy, make a decision, or infer new data from existing data." In systems that have been developed over decades, business rules ultimately come to run the business, though the rules are rarely documented or fully understood.

This situation produces a typical cart-before-the-horse legacy scenario, where the business is no longer truly in control of how it is run. Ideally, the business defines each rule, so the business should be able to understand each business rule,

even ones that were implemented 25 years earlier. A shaky grasp of business rules leads to numerous issues. Notably, programmers often must implement new programs with only a basic understanding of how the program impacts existing rules and processes. Worse, what isn't documented isn't tested before implementation, setting the stage for discrepancies, new rounds of testing and extra cost.

Ultimately, the old adage holds: You cannot improve what you do not know and do not measure. Documenting and understanding the rules that run your business is the first step to improving the business. X-2E Analysis' Application Process Mapping functionality is designed to meet the challenge.

Business Rule Analysis and Documentation

Application Process Mapping Instantly Exposes Your Complete Business Rules Inventory

Here's an example of how the X-2E Application Process Mapping functionality provides instant access to a legacy system's business rule assets, even for non-legacy experts. A hospital has the following business rule: "The admission amount for a patient is determined by their medical insurance status". This rule will end up being implemented in code as seen on the left below. On the right hand side is an example of how this code is summarized in a form of readable pseudo code by the Application Process Mapping functionality.

```
Case
  If DTL.Patient_Status = 'H'
    DTL.Amount = 5000.00
  If DTL.Patient_Status = 'Z'
    DTL.Amount = 12000.00
  If DTL.Patient_Status = 'P'
    DTL.Amount = 8000.00
  If *OTHERWISE
    DTL.Amount = 1000.00
Endcase
```



```
CASE
R00001 If Patient_Status is Private Paid Upfront
  Deposit Amount = 5000.00
R00002 If Patient_Status is No Medical Insurance
  Deposit Amount = 12000.00
R00003 If Patient_Status is Hospital Plan Only
  Deposit Amount = 8000.00
R00004 If *OTHERWISE
  Deposit Amount = 1000.00
ENDCASE
```

These pseudo rules can be printed, viewed, cross referenced, exported as XML and consolidated back to the database files/fields by user interface or programs.

How many rules does the typical IBM i application have?

X-Analysis has been used by many IBM i shops around the world over the last 25 years to analyze many different applications. A "typical" CA 2E application consists of around a million lines of code (though some are much, much larger) and contains around 30,000 business rules.

Why Care About Business Rules?

Critical business rules used to operate your company effectively are scattered across your legacy software code. Fresche's services and technologies have analyzed billions of lines of RPG, Cobol and CA 2E code on IBM i machines over 25 years. Some compelling reasons for business rule management have evolved from these experiences:

- ▶ Business rules often outlive people AND software applications. A company might replace, rewrite or modernize a system, but most of the rules will stay the same.
- ▶ Management decisions and/or regulatory changes are often implemented as business rule logic in source code.
- ▶ The same business rule may not necessarily be implemented consistently in multiple places across the software code. The business will run, but not as effectively as it could.
- ▶ Some inherited business rules embedded in legacy systems might actually hinder the business.
- ▶ In very old systems where architects, management and designers have long since left, the software code may be the only source of some critical business rules.
- ▶ Companies that have direct access and visibility of all the business rules in their software code respond more quickly to business dynamics.
- ▶ Companies that optimize the reuse of proven business rules in the software code improve business agility and overall costs. Proven business rule software code is expensive to develop.
- ▶ CA 2E-generated RPG code might be a good way to implement business rules; it is not a very good way to document or analyze them. Simplifying and improving communication between various business stakeholders is a critical requirement for any company.
- ▶ Business rules are defined by (and belong to) the business - not IT. It is therefore imperative they should be able to read and understand them.

Business Rule Analysis and Documentation

Using business rules for rewrite/reengineering projects

Starting new rewrite projects by attempting to define business rules from scratch is hugely time consuming. In most cases, the majority of legacy business rules will be carried forward to the new system. There will be additions and changes, but most of the existing business rules remain valid and useful. Application Process Mapping lets you feed the recovered rules to analysts, users and developers through X-2E Analysis' GUI and its generated Word, Excel and XML documents. This greatly facilitates analyst development of specifications for the new system, reducing time and cost, and improving communication and accuracy.

Using Business Rules for Projects to Replace Legacy Systems

The primary challenge of replacing legacy systems with purchased Commercial Off The Shelf (COTS) packages is understanding the gaps between the systems. While IT and users are more familiar with their own legacy system, they typically do not have a complete inventory of all business logic, which the business is dependent upon for operations and management. Using a tool like X-2E Analysis to systematically recover all the business rules (as well as data model rules) provides a solid foundation from which to evaluate gaps with the COTS package.

Business Rules For Maintenance Activities

IT organizations that support legacy systems are moving to implement business logic through the use of Business Rule Management Systems. Such systems are portable, durable, accessible and easy to maintain. An excellent beginning is to use X-2E Analysis to recover your business rules from your legacy systems; clean them up by identifying and refactoring duplicate, obsolete or inconsistent rules; and build a simple working repository of business rules that analysts, users and developers can use as the basis for all future development.

Business Rules for Audits

Whether audits are performed for regulatory compliance or to determine code quality, a complete set of business rules (along with extensive where-used drill-downs) is essential to ensure that all crucial aspects of the business are covered.

Direct Benefits to IT

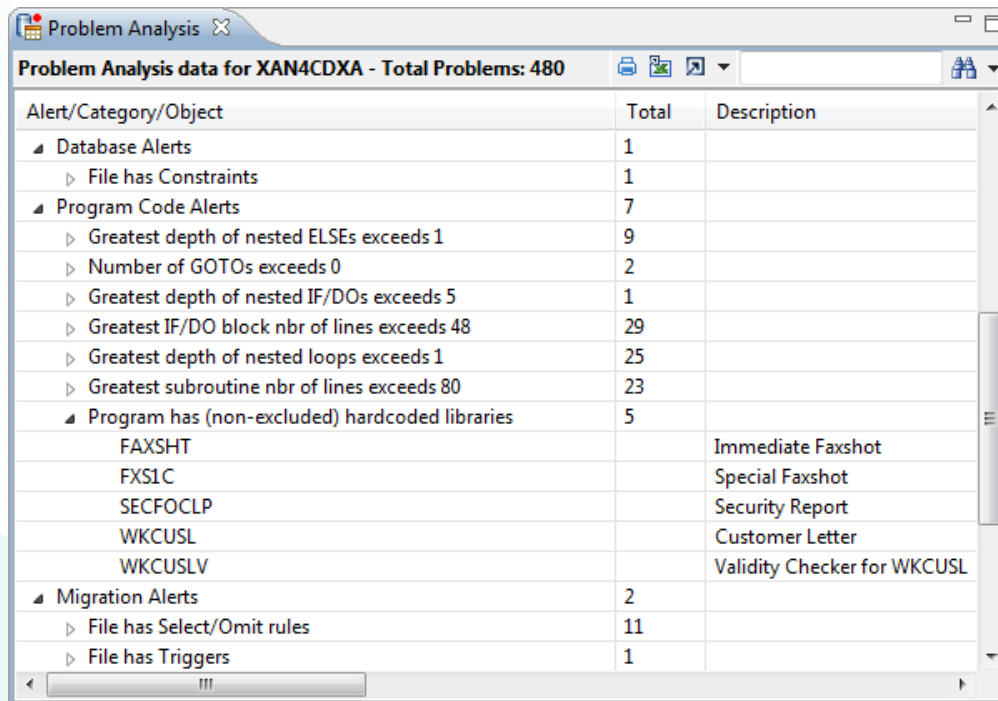
Here are a few direct IT benefits associated with a structured approach to business rules management in software code:

- ▶ To help Business Analysts understand and work with the system
- ▶ To communicate system functionality to users and management
- ▶ To help developers understand (and find) existing functionality
- ▶ To improve system quality by facilitating consistency and accuracy
- ▶ To increase programmer productivity by enabling code reuse
- ▶ To feed the reengineering and migration process with design documentation
- ▶ To help evaluate the suitability of packaged software replacements

Source Member	Rule Number	Field	File	Rule
TSAJE1R	00011	Address_Post_Zip	TSACREP	IF WRK.Alpha 6 NE DTL.Hospital Address Post/Zip
TSBCE1R	00010	Country	TSACREP	IF DTL.Hospital Country is Canada
TSBCE1R	00011	Address_Post_Zip	TSACREP	IF WRK.Alpha 6 NE DTL.Hospital Address Post/Zip
TSBGPF	0000			No Status
TSBHE1R	0000			Applicable Not able to be generated Not assigned
TSBHE1R	0000			Complete
TSBHE1R	0000			QA Done
TSBIE1R	0000			Awaiting feature
TSBIE1R	0000			Assigned
TSBMPFR	0000			Not applicable
TSBMPFR	0000			Covered by Metadata Not Verified

Application Metrics

Use Metrics, Problem Analysis and Difference Analysis to Manage Your CA 2E Applications



The screenshot shows a window titled "Problem Analysis" with a sub-header "Problem Analysis data for XAN4CDXA - Total Problems: 480". The main content is a table with three columns: "Alert/Category/Object", "Total", and "Description".

Alert/Category/Object	Total	Description
Database Alerts	1	
File has Constraints	1	
Program Code Alerts	7	
Greatest depth of nested ELSEs exceeds 1	9	
Number of GOTOs exceeds 0	2	
Greatest depth of nested IF/DOs exceeds 5	1	
Greatest IF/DO block nbr of lines exceeds 48	29	
Greatest depth of nested loops exceeds 1	25	
Greatest subroutine nbr of lines exceeds 80	23	
Program has (non-excluded) hardcoded libraries	5	
FAXSHT		Immediate Faxshot
FXS1C		Special Faxshot
SECFOCLP		Security Report
WKCUSL		Customer Letter
WKCUSLV		Validity Checker for WKCUSL
Migration Alerts	2	
File has Select/Omit rules	11	
File has Triggers	1	

The X-2E metrics analysis functionality gives you a highly detailed picture of your application and database metrics, including lists and locations of constraints, duplicates, unused files, multiple record formats, missing sources, unused subroutines and procedures and a host of database-related problems.

Some application metric highlights in X-2E Analysis:

- ▶ Program Complexity Metrics: low, medium and high complexity classification of programs
- ▶ Screen Display Complexity Metrics Analysis
- ▶ Database File Metrics Analysis
- ▶ Metrics Report Writer – Complete customizable report writer for building complexity and analysis reports
- ▶ Problem Analysis for design oddities, such as:
 - ▶ Files with constraints
 - ▶ PFs with non-unique keys
 - ▶ Unused procedures
 - ▶ And many more...
- ▶ Audit Report – MS Word or PDF wizard generates structured reports of metrics and problem analysis results
- ▶ Difference analysis between two versions of a system, comparing business rules, database designs, database relations, programs
- ▶ PTF impact analysis – by comparing a PTF library repository with production repository
- ▶ And much more...

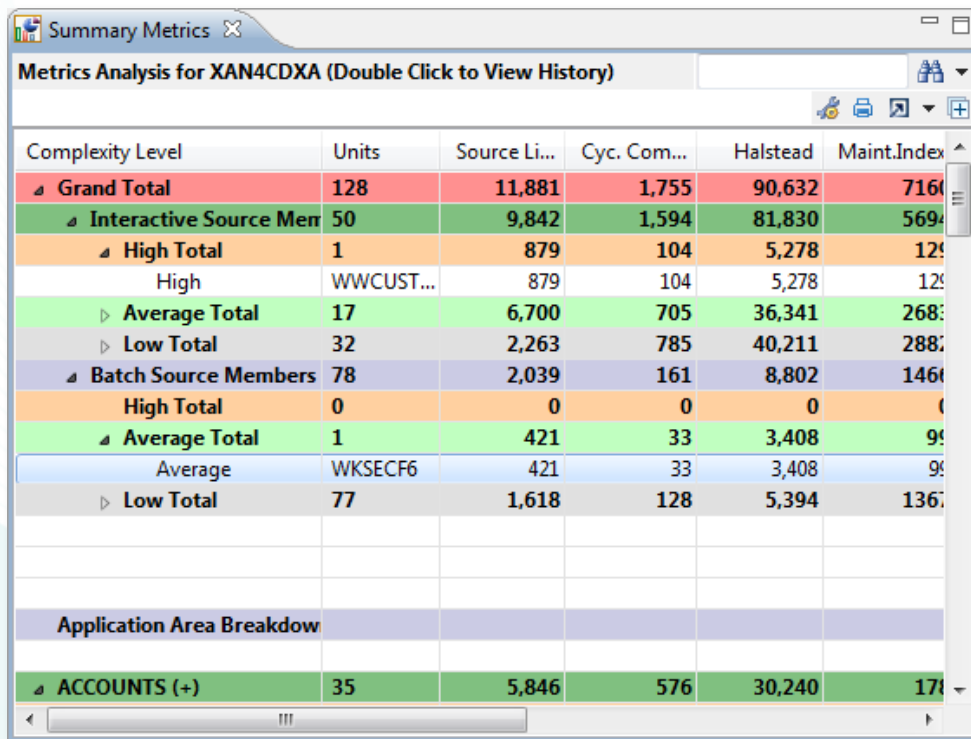
You Cannot Improve What You Do Not Measure

Applications running on IBM i are typically large, complex and have been developed by a variety of programmers and analysts over several decades. Without an automated audit and analysis tool, understanding such applications is almost impossible, especially for new resources who have to take over maintenance and development. The audit, quality and change management features of X-2E Analysis provide an

exhaustive breakdown of every aspect of your application portfolio. Without this linked, cross-referenced summary of your applications and databases, change management becomes a guessing game, and testing times and remediation cycles increase. In addition, without thorough knowledge of your applications, modernization of even small parts of the system becomes daunting, as complete impact is unknown.

Application Metrics

Metrics Analysis is the Key to Improving Your CA 2E Applications and Development



The screenshot shows a window titled "Summary Metrics" with a sub-header "Metrics Analysis for XAN4CDXA (Double Click to View History)". The window contains a table with the following data:

Complexity Level	Units	Source Li...	Cyc. Com...	Halstead	Maint.Index
Grand Total	128	11,881	1,755	90,632	716
Interactive Source Mem	50	9,842	1,594	81,830	569
High Total	1	879	104	5,278	12
High	WWCUST...	879	104	5,278	12
Average Total	17	6,700	705	36,341	268
Low Total	32	2,263	785	40,211	288
Batch Source Members	78	2,039	161	8,802	146
High Total	0	0	0	0	0
Average Total	1	421	33	3,408	9
Average	WKSECF6	421	33	3,408	9
Low Total	77	1,618	128	5,394	136
Application Area Breakdown					
ACCOUNTS (+)	35	5,846	576	30,240	17

The complexity metrics feature of X-2E Analysis enables managers of legacy systems to measure, monitor and proactively manage complexity and changes to the applications.

Metrics Analysis Features

- ▶ Metrics calculated at both program and subroutine/procedure level
- ▶ All metrics exportable to Excel
 - ▶ Cyclomatic complexity
 - ▶ Halstead volume
 - ▶ Maintainability index
 - ▶ Number of source line statements in the program
 - ▶ Number of GOTOs or CABxx statements
 - ▶ Greatest nesting depth of IF/DO statements
 - ▶ Greatest number of statements within an IF/DO block of code
 - ▶ Greatest depth of nested DO/FOR loops
 - ▶ Greatest depth of nested ELSE statements
- ▶ Optionally transform the product into new languages with further use of transformation robots
- ▶ Test and deploy the iteration.

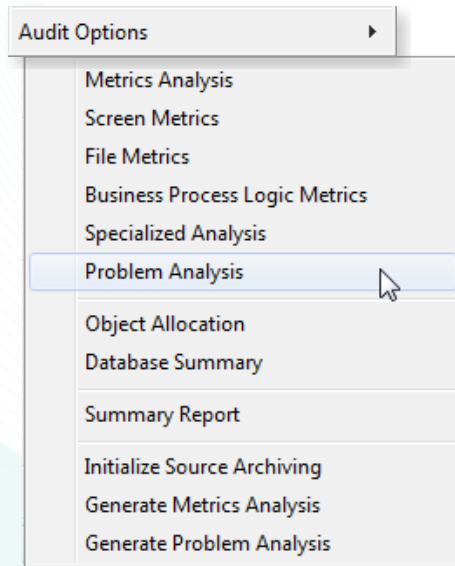
Audit for Problems, Complexity and Change

- ▶ Understand where the most complex code in the system resides and plan accordingly.
- ▶ Audit the difference between versions of a system at a design level — not just code.
- ▶ Be alerted to potentially harmful system conditions and defects before they cause production problems.
- ▶ Track changes in new versions of packaged applications to plan for refitting customizations.
- ▶ Externalize rules so they can be shared by multiple applications.
- ▶ Compare versions of your custom applications at different points in time to track where changes were deployed.

Application Metrics

A Wide Range of Options and Functionality

In addition to problem analysis (pictured on page 12) and metrics analysis (described on page 13), the X-2E provides numerous functions to help manage your IBM i applications. Some of the highlights:



SPECIALIZED ANALYSIS

Allows you to design your own reports using the full metrics database in the defined system repository. This reporting provides a valuable way to measure and manage the quality and complexity of a code base. You can run one-off static reports or create DIFFERENCE REPORTS, in which you compare two or more versions of an application at different points in time to discover changes in:

- Source code
- Business rules
- Table and field definitions
- Table relationships

Heading/Object/Category	Description	Class	Type	Name
CHANGED	Changed Files	APPLY	*FILE	CUSFMA
CNTACS	Contacts	APPLY	*FILE	ORGS
FIELDS	Database File Fields	APPLY	*FILE	ORGLI
RELNS	Database File Relationships	APPLY	*PGM	CUSGRS
CNTLF1	Global Contacts by Salesman	APPLY	*PGM	CUSTSS
CNTLF2	Global Contacts by Name	APPLY	*PGM	DISTSS
CNTLF3	Global Contacts by Status	APPLY	*PGM	DSPTTY
CNTLF4	Global Contacts by Prod & Status	MODIFIED	*FILE	CNTCMA
CONDET	Contract Detail	MODIFIED	*FILE	CONDET
CONHDR	Contract Header	MODIFIED	*FILE	CONDET
CUSF	Sites	MODIFIED	*FILE	CUSFSE
DISTS	Distributors	MODIFIED	*FILE	CUSTMI
CUSFL7D		MODIFIED	*FILE	CUSTS

Class	Type	Name	Description	PTF Change Date
NEW	HTML	HTML1	Sample HTML	12/08/10
NEW	RPGL	\$CSAMPLE	Copy book for C specs	12/08/10
NEW	RPGL	\$DSAMPLE	Copy book for D specs	12/08/10
NEW	SQL	DISTSQRY		12/08/10
REFERENCED	*FILE	CNTCMAINTD	Contacts Maintenance	19/03/10
REFERENCED	*FILE	CONDET	Contract Detail	19/03/10
REFERENCED	*FILE	CUSFMAINTD	Customer Site Maintenance	19/03/10

SCREEN METRICS

Displays low, medium and high complexity classification of all the available screen functions.

BUSINESS PROCESS LOGIC METRICS

Displays business process logic data in metrics form - total lines, included lines, excluded lines, unmarked lines etc.

DATABASE SUMMARY

Provides access to a summarized database report for the entire cross-reference library. The report contains information related to files, their unique keys and other necessary file-related details.

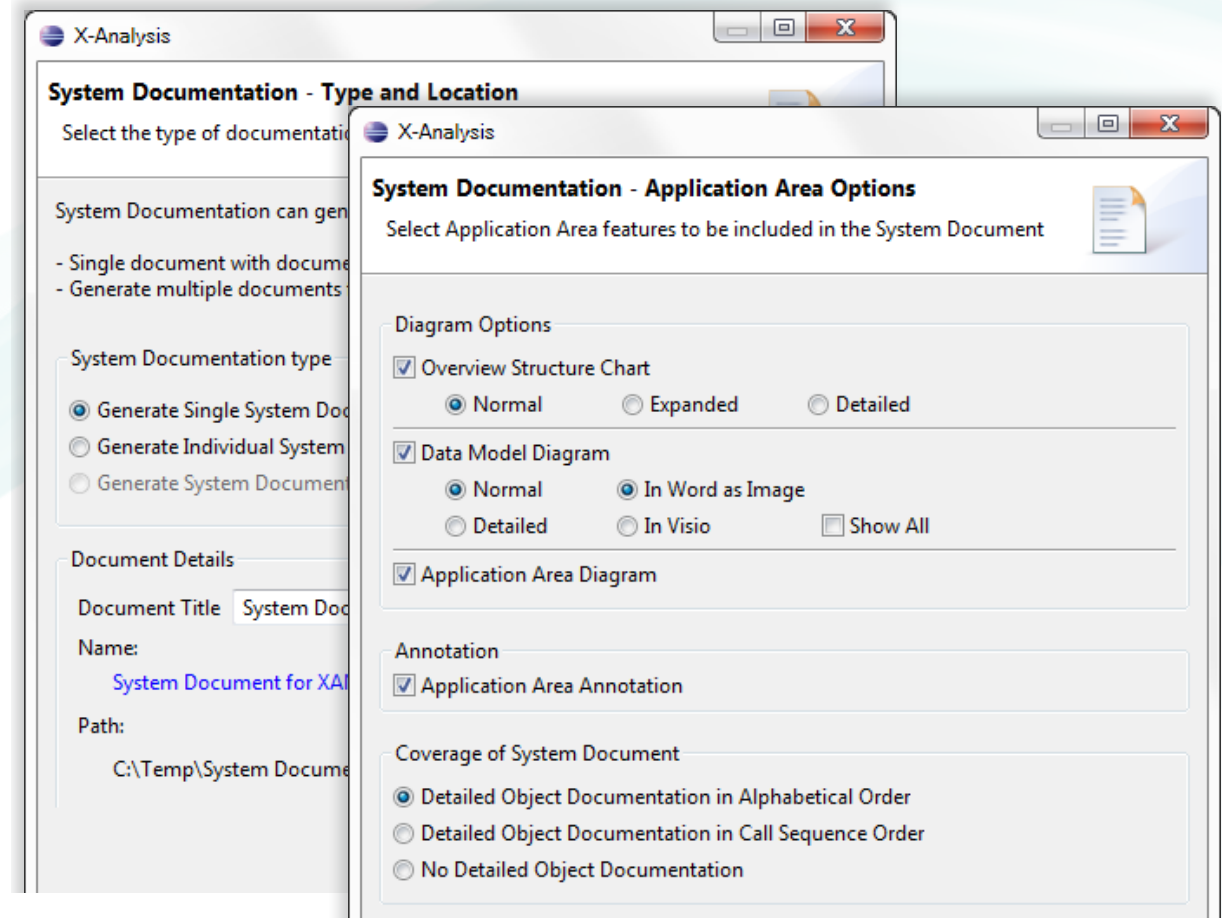
Automated Documentation Generator

A Wide Array of Functionality

X-2E Analysis provides numerous ways to view your application code and architecture. In addition to the diagrams described above, the tool offers the following:

- ▶ RPG as Pseudo Code: With a single click, RPG can be viewed as a form of structured English or pseudo code. Mnemonics are substituted with file/field/variable texts and constants or literals. Pseudo code is a great help even for experienced professionals as it explains the program logic in simple English.
- ▶ Diagrams in Visio: Any interactive diagram produced by X-2E Analysis in the client can be automatically exported instantly to MS Visio with a single click. In addition to this, a CA 2E program can be produced as a data flow chart interactively while browsing the source from within X-2E Analysis. If the RPG program is in Pseudo Code mode, the Data Flow Chart will use the narratives from the Pseudo code. This enables non-IBM i technologists and analysts to assimilate information at a detailed level of the application without any dependency on experts.
- ▶ Lists and result sets: Any source, object, or impact-analysis result list can be directly exported to formatted MS Excel, Word or Open Office with a single click while using the client.

- ▶ Microsoft Word Project Documentation Wizard: Documents often take weeks to produce manually. With a simple wizard, a user can select any of the graphical diagrams, lists, flowcharts, annotation and business rule summaries generated interactively by the client interface, and collate the information into a single document with contents and index. This can be done for a single object, an application area, a list of objects, or an entire system. These documents can be edited and distributed as required.



Functionality Summary



X-2E Analysis

X-2E Analysis:

Automated documentation, impact analysis, business rule extraction, and audit, quality and change management

X-2E Analysis Summary of Functionality

- ▶ Variable Tracing - drilling down through multiple layers or variables and programs/files/screens long and short names
- ▶ Interactive source code browser for Action Diagrams and non-2E Code
- ▶ Interactive structure chart diagrams
- ▶ Interactive data flow diagrams
- ▶ Object where used including internal routine usage
- ▶ Program Structure Charts including internal Routine Explosion
- ▶ Plug-in to Eclipse or WDS/CDi/RDp
- ▶ Subdivide system into application areas and embed into other application areas
- ▶ Application Area Diagrams
- ▶ Restrict diagrams or show the objects that belong to an application area only.
- ▶ MS Word project/static documentation wizard
- ▶ Visio exports for graphical diagrams
- ▶ Subroutine layering diagrams (program structure charts)

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- ▶ Link to SEU or CODE/400 and LPEX editors
- ▶ Indented source code views
- ▶ Program understanding at an application level, rather than a complete system level.
- ▶ All other modules have use of application level control as opposed to entire system level functionality
- ▶ Object Annotation repository or Word Doc based
- ▶ MS Word/Excel exports of all lists and graphical diagrams.
- ▶ Automated generation of relational data model from CA 2E
- ▶ Entity relationship diagrams
- ▶ Data encyclopedia/dictionary
- ▶ View the data in the data files from the model
- ▶ Instant & Automated Structured, drill-down browsing of test/live data
- ▶ Browsing and analysis of data dictionary
- ▶ Screen Display Complexity Metrics Analysis
- ▶ Database File Metrics Analysis



Functionality Summary - Cont'd.



X-2E Analysis

X-2E Analysis:

Automated documentation, impact analysis, business rule extraction, and audit, quality and change management

X-2E Analysis Summary of Functionality - Cont'd.

- ▶ Program Complexity Metrics – low, medium and high complexity classification of programs based upon each programs number of: Cyclomatic, Halstead, Maintainability Index, Source Lines and other useful metrics associated with program complexity
- ▶ Metrics Report Writer– Complete customizable report writer for building complexity and analysis reports using the X-2E Analysis metrics repository. Trends, static analysis and source change reports included.
- ▶ Problem Analysis for design oddities, such as files with constraints, PFs with non-unique keys, unused procedures, etc.
- ▶ Audit Report – MS Word or PDF wizard generates structured reports of metrics and problem analysis results
- ▶ Link multiple repositories for combined analysis throughout all functions
- ▶ Builds a difference analysis between two versions of a system comparing
 - ▶ Business rules
 - ▶ Database designs
 - ▶ Database relations
 - ▶ Programs
- ▶ Builds a PTF impact analysis by comparing a PTF library repository with production repository
- ▶ Export of DDL from relational data model
- ▶ Identifies and documents business rule logic from 2E Action Diagrams
- ▶ Analysis and cross referencing of business rule logic in 2E Action Diagrams
- ▶ Individual Business Rule Annotation
- ▶ Business Rule Where Used & Summaries
- ▶ Business Rule Database
- ▶ Business Rule Exports to MS Word and EXCEL
- ▶ Screen design and report layouts at a glance
- ▶ Business rules consolidated by Program, Table/Field, Display formats/Screens
- ▶ Business processes as Pseudo code
- ▶ Screen Flow Diagrams
- ▶ Source levelling (summarization of source members) by source line type
- ▶ Export of UML Class Diagrams from relational data model
- ▶ Generation of UML Activity Diagrams



About Fresche Legacy

As a leading expert in legacy management and modernization, Fresche Legacy helps enterprise organizations transform their business to improve financial performance, increase market competitiveness, remove risk and add business value. Our team of experts has successfully completed hundreds of transformation projects within the most complex enterprise environments, helping organizations future-proof their business by modernizing their business processes, technologies, infrastructure, and methodologies. Committed to 100 percent customer satisfaction, Fresche Legacy's services and solutions span the complete legacy modernization spectrum from concept to maintenance, and include Discovery Services, Modernization Solutions, and Application Management Services & Transformation. For more information about our company, visit us on the Web at www.freschelegacy.com

X-Analysis Professional is the foundation of the full X-Analysis toolset, a suite of productivity tools for your IBM i applications. The CA 2E Analysis module contains the full analysis, documentation and impact analysis functionality of X-Analysis Professional, as well as all Application Process Mapping functionality and Audit, Quality and Change Management functionality.



X-Analysis Professional: The foundation tool, with all of the basic functionality.



CA 2E Analysis: Everything required to analyze and document CA 2E applications.



Application Process Mapping: Business rule and relational data model extraction and documentation of application processes and flows.



Application Modernization: RPG, COBOL and CA 2E (Synon) automatically converted to Java.



Audit, Quality and Change Management: Auditing of core application functionality - including design, quality and complexity - to identify and change problematic areas in the application.



Database Modernization: Automated conversion of DDS to DDL, including creation of constraints, long field names and views.



Data and Test Management: Analysis of data quality; data archiving, data subsetting and data masking. Test data automation and management.



Open Systems Analysis: Cross-referencing and documentation of Java, C#, PHP, VB/VB.NET and PowerBuilder.

How to get on board: X-Analysis products are available as a complete package or as individual modules. At Fresche Legacy, we work closely with you to assess your needs and recommend the best solutions. To get started, contact us using the information below:

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