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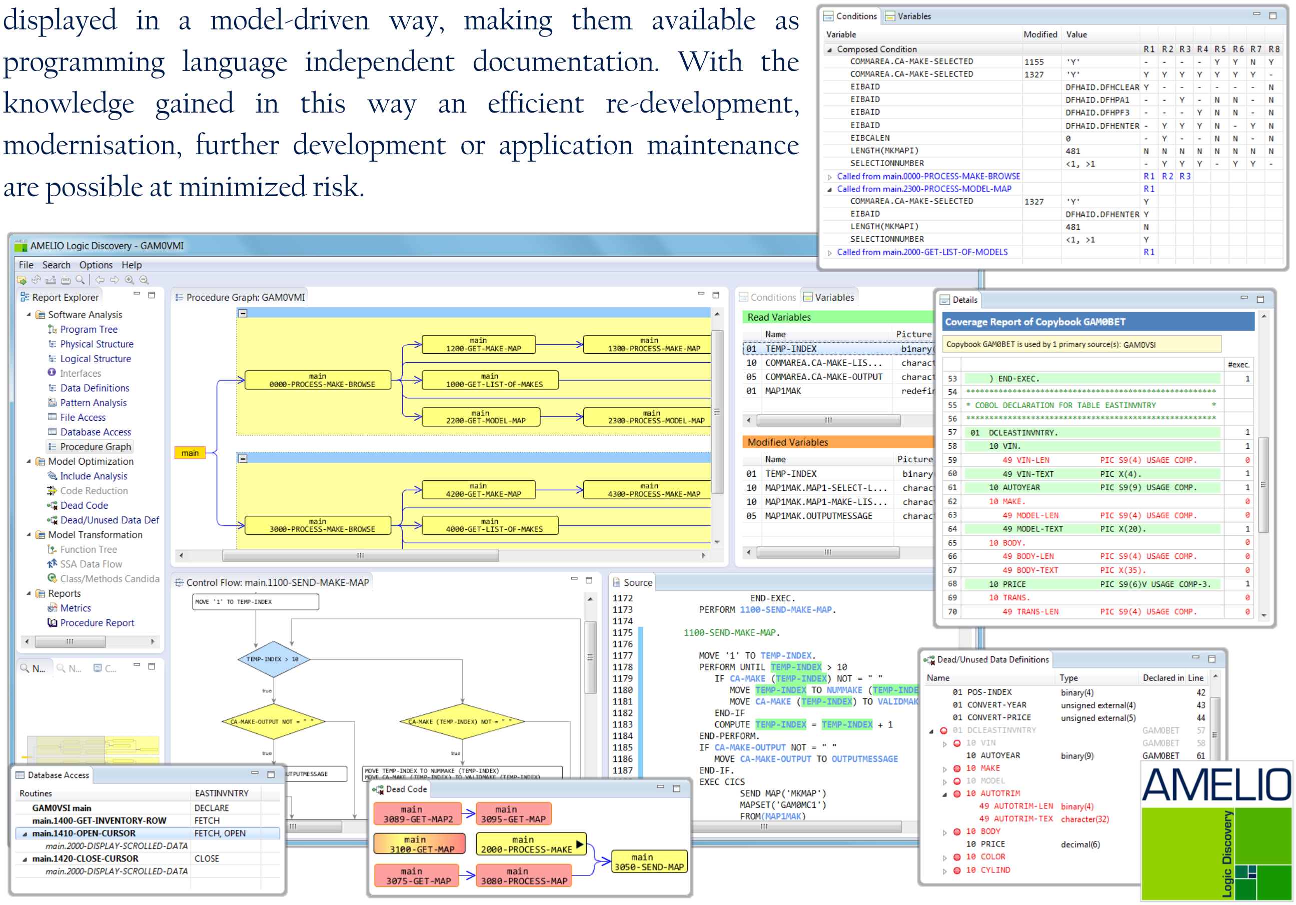
AMELIO LOGIC DISCOVERY

FOR COBOL

AMELIO Logic Discovery is an innovative analysis tool that helps to understand COBOL applications better and extracts its relevant functionality. It analyses large and complex applications and derives knowledge about the application functionality from the implementation details. Application logic is separated from the technical infrastructure. Analysis results are displayed in a model-driven way, making them available as programming language independent documentation. With the knowledge gained in this way an efficient re-development, modernisation, further development or application maintenance are possible at minimized risk.



Conditions | Variables

Variable	Modified	Value	R1	R2	R3	R4	R5	R6	R7	R8
Composed Condition			R1	R2	R3	R4	R5	R6	R7	R8
COMMAREA.CA-MAKE-SELECTED	1155	'Y'	-	-	-	-	Y	Y	N	Y
COMMAREA.CA-MAKE-SELECTED	1327	'Y'	Y	Y	Y	Y	Y	Y	Y	-
EIBAID		DFHAID.DFHCLEAR	Y	-	-	-	-	-	-	N
EIBAID		DFHAID.DFHPA1	-	-	Y	-	N	N	-	N
EIBAID		DFHAID.DFHPF3	-	-	-	Y	N	N	-	N
EIBAID		DFHAID.DFHENTER	-	Y	Y	Y	N	-	Y	N
EIBCALEN		0	-	Y	-	-	N	N	-	N
LENGTH(MKMAPI)		481	N	N	N	N	N	N	N	N
SELECTIONNUMBER		<1, >1	-	Y	Y	Y	-	Y	Y	-
Called from main.0000-PROCESS-MAKE-BROWSE			R1	R2	R3					
Called from main.2300-PROCESS-MODEL-MAP			R1							
COMMAREA.CA-MAKE-SELECTED	1327	'Y'	Y							
EIBAID		DFHAID.DFHENTER	Y							
LENGTH(MKMAPI)		481	N							
SELECTIONNUMBER		<1, >1	Y							
Called from main.2000-GET-LIST-OF-MODELS			R1							

Read Variables

	Name	Picture
01	TEMP-INDEX	binary(
10	COMMAREA.CA-MAKE-LIS...	charact
05	COMMAREA.CA-MAKE-OUTPUT	charact
01	MAP1MAK	redefir

Modified Variables

	Name	Picture
01	TEMP-INDEX	binary
10	MAP1MAK.MAP1-SELECT-L...	charact
10	MAP1MAK.MAP1-MAKE-LIS...	charact
05	MAP1MAK.OUTPUTMESSAGE	charact

Coverage Report of Copybook GAM0BET

Copybook GAM0BET is used by 1 primary source(s): GAM0VSI

		#exec.
53	) END-EXEC.	1
54	**	
55	* COBOL DECLARATION FOR TABLE EASTINVNTRY *	
56	**	
57	01 DCLEASTINVNTRY.	1
58	10 VIN.	1
59	49 VIN-LEN PIC S9(4) USAGE COMP.	0
60	49 VIN-TEXT PIC X(4).	1
61	10 AUTOYEAR PIC S9(9) USAGE COMP.	1
62	10 MAKE.	0
63	49 MODEL-LEN PIC S9(4) USAGE COMP.	0
64	49 MODEL-TEXT PIC X(20).	1
65	10 BODY.	0
66	49 BODY-LEN PIC S9(4) USAGE COMP.	0
67	49 BODY-TEXT PIC X(35).	0
68	10 PRICE PIC S9(6)V USAGE COMP-3.	1
69	10 TRANS.	0
70	49 TRANS-LEN PIC S9(4) USAGE COMP.	0

```
               END-EXEC.
     PERFORM 1100-SEND-MAKE-MAP.

 1100-SEND-MAKE-MAP.

     MOVE '1' TO TEMP-INDEX.
     PERFORM UNTIL TEMP-INDEX > 10
        IF CA-MAKE (TEMP-INDEX) NOT = " "
           MOVE TEMP-INDEX TO NUMMAKE (TEMP-INDE
           MOVE CA-MAKE (TEMP-INDEX) TO VALIDMAK
        END-IF
        COMPUTE TEMP-INDEX = TEMP-INDEX + 1
     END-PERFORM.
     IF CA-MAKE-OUTPUT NOT = " "
        MOVE CA-MAKE-OUTPUT TO OUTPUTMESSAGE
     END-IF.
     EXEC CICS
             SEND MAP('MKMAP')
             MAPSET('GAM0MC1')
             FROM(MAP1MAK)
```

Database Access

Routines	EASTINVNTRY
GAM0VSI main	DECLARE
main.1400-GET-INVENTORY-ROW	FETCH
main.1410-OPEN-CURSOR	FETCH, OPEN
main.2000-DISPLAY-SCROLLED-DATA	
main.1420-CLOSE-CURSOR	CLOSE
main.2000-DISPLAY-SCROLLED-DATA	

Dead/Unused Data Definitions

Name	Type	Declared in	Line
01 POS-INDEX	binary(4)		42
01 CONVERT-YEAR	unsigned external(4)		43
01 CONVERT-PRICE	unsigned external(5)		44
01 DCLEASTINVNTRY		GAM0BET	57
10 VIN		GAM0BET	58
10 AUTOYEAR	binary(9)	GAM0BET	61
10 MAKE			
10 MODEL			
10 AUTOTRIM			
49 AUTOTRIM-LEN	binary(4)		
49 AUTOTRIM-TEX	character(32)		
10 BODY			
10 PRICE	decimal(6)		
10 COLOR			
10 CYLIND			

Analyzing Application Logic

AMELIO Logic Discovery provides analyses with different goals and granularities for improved understanding of the application logic in COBOL applications.

Application Architecture

- Analyses of what programs and sub-programs do belong to an application. Detects call dependencies, including calling conditions and interface information.
- The analysis results are displayed graphically. Additional details, for example calling conditions and interface details, are represented textually.

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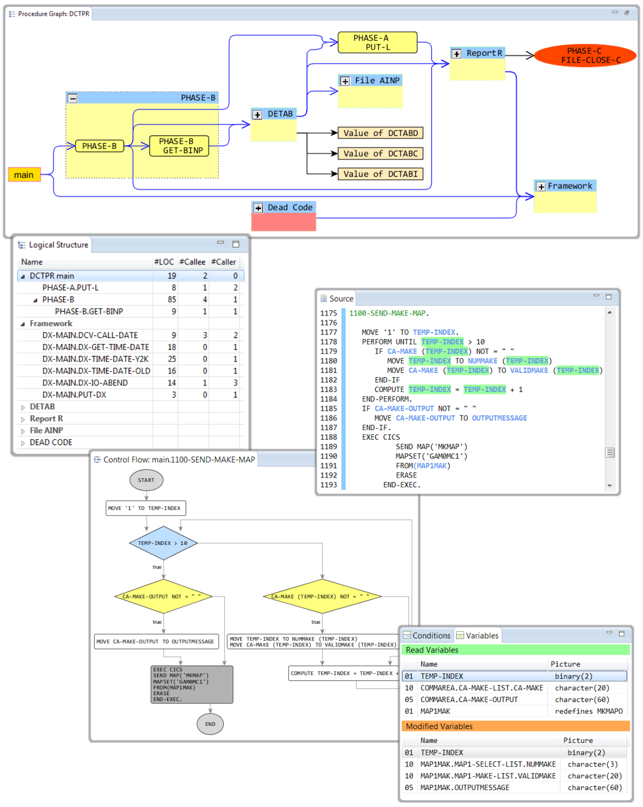
Procedure Detection

- Procedure definitions, unknown to the classic COBOL, are automatically derived from the execution of sections and paragraphs.
- The detected procedures and their dependencies are displayed graphically. Additionally, the detected procedures are displayed in a tree structure.
- For every procedure details like read and modified variables are displayed as well as their control flow which is represented as activity diagram.

Detection of Composites

- Procedures that build logical units are summarized in composites.
- The embedding of composites and their dependencies into the procedure graph. Additionally, the logical program structure including the composites and the included procedures are displayed as a tree structure.



Logical Structure

Name	#LOC	#Callee	#Caller
DCTPR main	19	2	0
PHASE-A.PUT-L	8	1	2
PHASE-B	85	4	1
PHASE-B.GET-BINP	9	1	1
Framework			
DX-MAIN.DCV-CALL-DATE	9	3	2
DX-MAIN.DX-GET-TIME-DATE	18	0	1
DX-MAIN.DX-TIME-DATE-Y2K	25	0	1
DX-MAIN.DX-TIME-DATE-OLD	16	0	1
DX-MAIN.DX-IO-ABEND	14	1	3
DX-MAIN.PUT-DX	3	0	1
DETAB			
Report R			
File AINP			
DEAD CODE			

Source

```
1100-SEND-MAKE-MAP.

   MOVE '1' TO TEMP-INDEX.
   PERFORM UNTIL TEMP-INDEX > 10
      IF CA-MAKE (TEMP-INDEX) NOT = " "
         MOVE TEMP-INDEX TO NUMMAKE (TEMP-INDEX)
         MOVE CA-MAKE (TEMP-INDEX) TO VALIDMAKE (TEMP-INDEX)
      END-IF
      COMPUTE TEMP-INDEX = TEMP-INDEX + 1
   END-PERFORM.
   IF CA-MAKE-OUTPUT NOT = " "
      MOVE CA-MAKE-OUTPUT TO OUTPUTMESSAGE
   END-IF.
   EXEC CICS
           SEND MAP('MKMAP')
           MAPSET('GAM0MC1')
           FROM(MAP1MAK)
           ERASE
        END-EXEC.
```

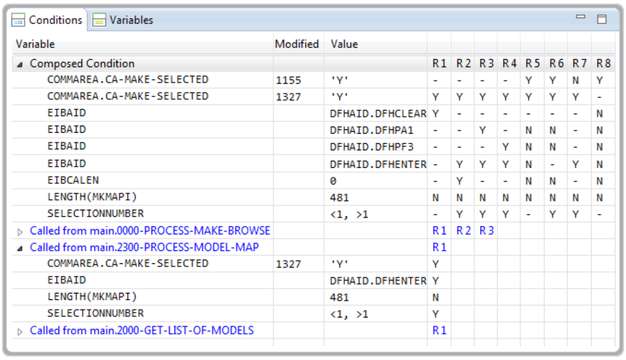
Read Variables

	Name	Picture
01	TEMP-INDEX	binary(2)
10	COMMAREA.CA-MAKE-LIST.CA-MAKE	character(20)
05	COMMAREA.CA-MAKE-OUTPUT	character(60)
01	MAP1MAK	redefines MKMAPO

Modified Variables

	Name	Picture
01	TEMP-INDEX	binary(2)
10	MAP1MAK.MAP1-SELECT-LIST.NUMMAKE	character(3)
10	MAP1MAK.MAP1-MAKE-LIST.VALIDMAKE	character(20)
05	MAP1MAK.OUTPUTMESSAGE	character(60)

Condition Analysis



Variable	Modified	Value								
Composed Condition			R1	R2	R3	R4	R5	R6	R7	R8
COMMAREA.CA-MAKE-SELECTED	1155	'Y'	-	-	-	-	Y	Y	N	Y
COMMAREA.CA-MAKE-SELECTED	1327	'Y'	Y	Y	Y	Y	Y	Y	Y	-
EIBAID		DFHAID.DFHCLEAR	Y	-	-	-	-	-	-	N
EIBAID		DFHAID.DFHPA1	-	-	Y	-	N	N	-	N
EIBAID		DFHAID.DFHPF3	-	-	-	Y	N	N	-	N
EIBAID		DFHAID.DFHENTER	-	Y	Y	Y	N	-	Y	N
EIBCALEN		0	-	Y	-	-	N	N	-	N
LENGTH(MKMAPI)		481	N	N	N	N	N	N	N	N
SELECTIONNUMBER		<1, >1	-	Y	Y	Y	-	Y	Y	-
Called from main.0000-PROCESS-MAKE-BROWSE			R1	R2	R3					
Called from main.2300-PROCESS-MODEL-MAP			R1							
COMMAREA.CA-MAKE-SELECTED	1327	'Y'	Y							
EIBAID		DFHAID.DFHENTER	Y							
LENGTH(MKMAPI)		481	N							
SELECTIONNUMBER		<1, >1	Y							
Called from main.2000-GET-LIST-OF-MODELS			R1							

- Determination of the conditions under which a sub-program is called from a main program. Also: analysis of the conditions under which a sub-program calls another sub-program.
- Under which aggregate condition based on the program start, a procedure is called. Also: under which aggregate condition is a procedure called from another procedure?
- Displaying the individual and summarized conditions in form of condition tables.

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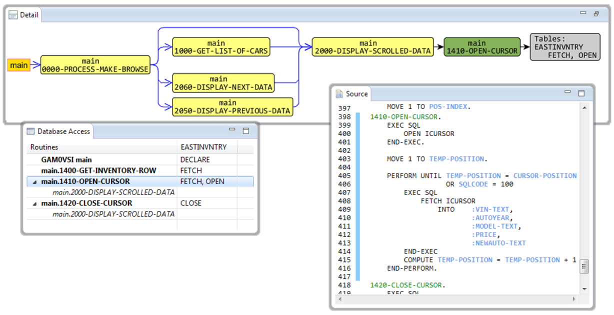
I/O-Analyses


Detail
main
main 0000-PROCESS-MAKE-BROWSE
main 1000-GET-LIST-OF-CARS
main 2060-DISPLAY-NEXT-DATA
main 2050-DISPLAY-PREVIOUS-DATA
main 2000-DISPLAY-SCROLLED-DATA
main 1410-OPEN-CURSOR
Tables: EASTINVNTRY FETCH, OPEN
Database Access
Source

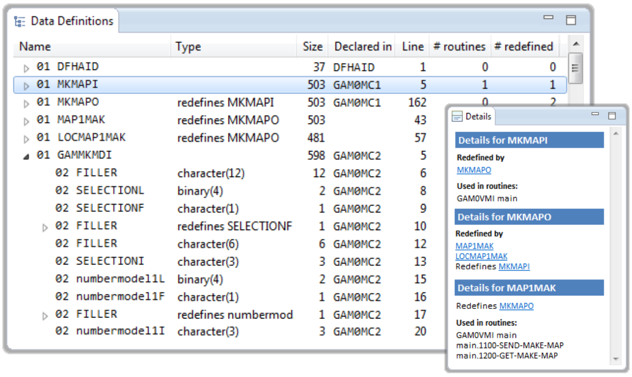
Routines	EASTINVNTRY
GAM0VSI main	DECLARE
main.1400-GET-INVENTORY-ROW	FETCH
main.1410-OPEN-CURSOR	FETCH, OPEN
main.2000-DISPLAY-SCROLLED-DATA	
main.1420-CLOSE-CURSOR	CLOSE
main.2000-DISPLAY-SCROLLED-DATA	

```
        MOVE 1 TO POS-INDEX.
    1410-OPEN-CURSOR.
        EXEC SQL
            OPEN ICURSOR
        END-EXEC.

        MOVE 1 TO TEMP-POSITION.

        PERFORM UNTIL TEMP-POSITION = CURSOR-POSITION
                      OR SQLCODE = 100
            EXEC SQL
                FETCH ICURSOR
                    INTO    :VIN-TEXT,
                            :AUTOYEAR,
                            :MODEL-TEXT,
                            :PRICE,
                            :NEWAUTO-TEXT
            END-EXEC
            COMPUTE TEMP-POSITION = TEMP-POSITION + 1
        END-PERFORM.

    1420-CLOSE-CURSOR.
        EXEC SQL
```

- Analyses which tables and files are accessed by a program.
- Which procedure accesses a certain file or table (column) for read or for update and where this procedure itself is called.
- Detection of potential CRUD procedures.

Data Definition Analysis

- Detection of all data elements that are defined in the program, including the data type and their use, and which data elements are re-defined by which other data elements.
- Copybook calls are expanded and thus also data elements that stem from a copybook are determined.



Name	Type	Size	Declared in	Line	# routines	# redefined
01 DFHAID		37	DFHAID	1	0	0
01 MKMAPI		503	GAM0MC1	5	1	1
01 MKMAPO	redefines MKMAPI	503	GAM0MC1	162	0	2
01 MAP1MAK	redefines MKMAPO	503		43		
01 LOCMAP1MAK	redefines MKMAPO	481		57		
01 GAMMKMDI		598	GAM0MC2	5		
02 FILLER	character(12)	12	GAM0MC2	6		
02 SELECTIONL	binary(4)	2	GAM0MC2	8		
02 SELECTIONF	character(1)	1	GAM0MC2	9		
02 FILLER	redefines SELECTIONF	1	GAM0MC2	10		
02 FILLER	character(6)	6	GAM0MC2	12		
02 SELECTIONI	character(3)	3	GAM0MC2	13		
02 numbermodel1L	binary(4)	2	GAM0MC2	15		
02 numbermodel1F	character(1)	1	GAM0MC2	16		
02 FILLER	redefines numbermod	1	GAM0MC2	17		
02 numbermodel1I	character(3)	3	GAM0MC2	20		

Details for MKMAPI

Redefined by
MKMAPO

Used in routines:
GAM0VMI main

Details for MKMAPO

Redefined by
MAP1MAK
LOCMAP1MAK
Redefines MKMAPI

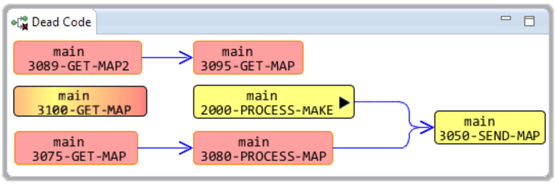
Details for MAP1MAK

Redefines MKMAPO

Used in routines:
GAM0VMI main
main.1100-SEND-MAKE-MAP
main.1200-GET-MAKE-MAP

Analyses for Code Elimination

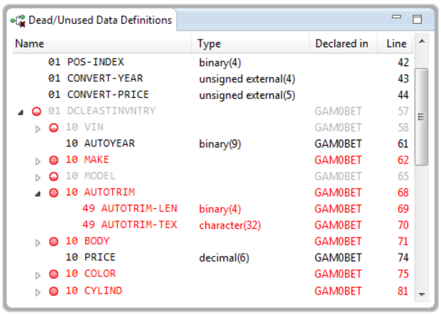
Dead Code Analysis



- Detects paragraphs and sections that are nowhere called or only called from dead paragraphs or sections.
- Analyses whether sections or paragraphs contain code that can never be executed.

Analysis of Superfluous Data Definitions

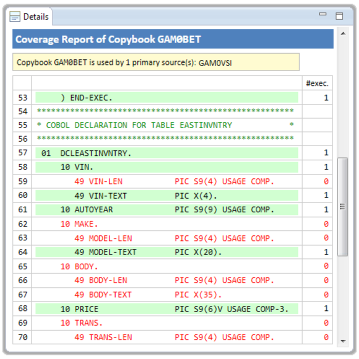
- Provides a list of data elements that are nowhere used or only used within dead code.
- Analyses for groups whether they or their subordinated elements are used.



Name	Type	Declared in	Line
01 POS-INDEX	binary(4)		42
01 CONVERT-YEAR	unsigned external(4)		43
01 CONVERT-PRICE	unsigned external(5)		44
○ 01 DCLEASTINVNTRY		GAM0BET	57
○ 10 VIN		GAM0BET	58
10 AUTOYEAR	binary(9)	GAM0BET	61
● 10 MAKE		GAM0BET	62
○ 10 MODEL		GAM0BET	65
● 10 AUTOTRIM		GAM0BET	68
49 AUTOTRIM-LEN	binary(4)	GAM0BET	69
49 AUTOTRIM-TEX	character(32)	GAM0BET	70
● 10 BODY		GAM0BET	71
10 PRICE	decimal(6)	GAM0BET	74
● 10 COLOR		GAM0BET	75
● 10 CYLIND		GAM0BET	81

Copybook-Analysis

- Detects for every used copybook whether it contains code parts which are dead code or dead data definitions in all analyzed programs.
- Detects which parts of the copybook are only required in specific programs and therefore should be better defined in these programs.



Details

Coverage Report of Copybook GAM0BET

Copybook GAM0BET is used by 1 primary source(s): GAM0VSI

```
                                                                   #exec.
53        ) END-EXEC.                                                   1
54  **************************************************
55  * COBOL DECLARATION FOR TABLE EASTINVNTRY               *
56  **************************************************
57   01  DCLEASTINVNTRY.                                                1
58       10 VIN.                                                        1
59          49 VIN-LEN            PIC S9(4) USAGE COMP.                 0
60          49 VIN-TEXT           PIC X(4).                             1
61       10 AUTOYEAR              PIC S9(9) USAGE COMP.                 1
62       10 MAKE.                                                       0
63          49 MODEL-LEN          PIC S9(4) USAGE COMP.                 0
64          49 MODEL-TEXT         PIC X(20).                            1
65       10 BODY.                                                       0
66          49 BODY-LEN           PIC S9(4) USAGE COMP.                 0
67          49 BODY-TEXT          PIC X(35).                            0
68       10 PRICE                 PIC S9(6)V USAGE COMP-3.              1
69       10 TRANS.                                                      0
70          49 TRANS-LEN          PIC S9(4) USAGE COMP.                 0
```

Reports and Exports

- Analysis results can be displayed as HTML reports.
- Additionally, all analyses can be exported to a number of different file types.

Predicate BEST OF 2015 for AMELIO Logic Discovery

The "Initiative Mittelstand" (Initiative for Small and Medium-sized Businesses) awarded AMELIO Logic Discovery with the predicate BEST OF 2015.

INNOVATIONSPREIS-IT
BEST OF 2015
initiative mittelstand
BEST OF

No "one size fits all" Solution

AMELIO
Logic Discovery

AMELIO Logic Discovery is configurable, in this way the amount of delivered analyses can be adapted to each use case. The presented analyses are only a selection, further analyses are available by default. Additional customer-specific analyses can be added.

Further information can be found here: **www.delta-software.com/amld**

Delta Software Technology

Delta Software Technology is a specialist for generative development tools that automate the modernisation, integration, development and maintenance of individual IT applications.

Our solutions help you to quickly and safely adapt your applications to new business requirements, architectures, technologies and technical infrastructures.

AMELIO® Modernization Platform™
The tailor-made factory for the modernisation of large IT applications: 100% automatically and that's why it is safe, reliable and error-free.

HyperSenses®
Integrated system for model driven development of DSLs and software generators.

SCORE® Adaptive Bridges™
Intelligent service enablement for the reuse of proven applications with modern technologies: flexible, profitable and non-invasive.

SCORE® Data Architecture Integration™
Data as real business services: fast, easy and independent of data architectures and management systems.

ADS™ Application Development for COBOL and PL/I
Platform independent development for future-proof back-end applications.

Delta has a more than 35-year track record of successfully delivering advanced software technology to Europe's leading organisations, including AMB Generali, ArcelorMittal, Deutsche Telekom, Hüttenwerke Krupp Mannesmann, Gothaer Versicherungen, La Poste, RDW, Suva and UBS.

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