# iSoftwerks, Inc. Application Development Guidelines for IBM Power Systems including AS/400, iSeries, and System i



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#### **Automated Data Mover**

This document describes the major components of the Automated Data Mover (ADM) an application system designed to move orders, inbound, from various sources to the iSeries order data base. The ADM consists of many different elements, database files, programs, commands, even REXX Queue processes. But through the application interfaces provided, the ADM process is fairly simple to manage.

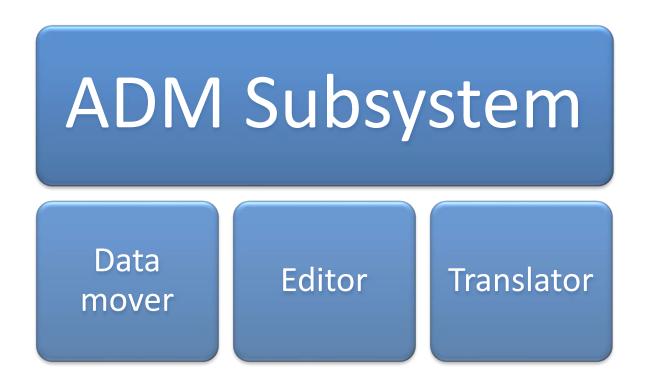


Fig. 1

At a system level, the three major components of the ADM exist in the subsystem named ADMSBS. This subsystem is an environment for the data mover job, the data editor, and the data translator.



#### **NEP Process**

The basis for the data mover consists of programs set to execute in a Never Ending Process (NEP). Each NEP for the ADM performs a selective function. The job, ADM\_MOVER wakes periodically to check if there are any orders to process. When orders are present in a specific IFS folder, the data mover converts the data from PCASCII to a DB2 database file. The inbound file is then moved from the inbound folder into an archive folder. When there are no more files to process the data mover goes to sleep (job delay). At intervals the program wakes, tests to see if it should exit, or process more files.

The editor is not as complicated as the data mover. The NEP ADM\_EDITOR does not move data. When orders are added to the ADM database, they have not been checked for errors. The editor reads the order data and tags the orders with an error flag, if discrepancies are found. If no errors are found, the editor sets the status of the order to 'Pending'—in effect passing the order on to the order translator. Like the data mover, the editor wakes at established intervals and tests to see if it should exit, or continue to edit data.

The data translator (ADM\_XLATE) works with a limited set of transactions. Only orders that have passed an edit will be examined. The translator maps the ADM data to the production order database. Once all pending orders have been mapped the translator goes into the delay mode and on waking, tests to see if it should exit or continue mapping data.

Starting the NEP process is simple. Start the subsystem with the command STRSBS SBSD(ADMSBS). This will initiate the subsystem. Then issue the command STRDTAMVR.

#### Start Data Mover

The start data mover command (STRDTAMVR) defaults to launching all of the NEP programs for the ADM system. However, the command can be prompted and each individual component may be selected to start, or not to start via the command parameters.

```
Bottom
F3=Exit F4=Prompt F5=Refresh F12=Cancel F13=How to use this display
F24=More keys
```

The command processing program (CPP) will submit each NEP job selected to start to the ADMSBS. Prior to start, the CPP will issue a command, SETADMPGM, to insure the NEP will not exit immediately on start up. The command sets the exit function on the named program to the value of 'NOEXIT'.



The End Data Mover (ENDDTAMVR) command is the functional opposite of the STRDTAMVR command. This is a command interface to allow an operator a method to end the data mover process in a controlled manner.

End Automated Data Mover (ENDDTAMVR)

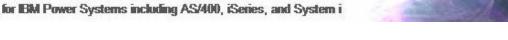
Type choices, press Enter.

End	the	data	mover .					Y	Υ,	N
End	the	data	editor					<u>Y</u>	Υ,	Ν
End	the	data	transla	toı	-			<u>Y</u>	Υ,	Ν

```
F3=Exit F4=Prompt F5=Refresh F12=Cancel F13=How to use this display
F24=More keys
```

The control instructions will be set to cause the data mover jobs to end as soon as the NEP checks to see if it should exit or continue processing.

The command default is to end all ADM NEP processes. However, the user may choose to end any one of the jobs individually. This will not cause the any interruption in the actual data mover process. If the NEP is active all records will be processed before the job terminates.



#### SETADMPGM Command

The command SETADMPGM may be used to cause the NEP programs to quit or it may be used to make sure the NEP does not quit.

```
Bottc
F3=Exit F4=Prompt F5=Refresh F12=Cancel F13=How to use this display
F24=More keys
```

The ADM program is one of the special values selected (you must chose one), \*MOVER, \*EDITOR, or \*XLATE.

The exit value can be \*EXIT, which is a signal for the NEP to quit, or the value can be \*NOEXIT, which means the NEP will not end.

Before ending the ADMSBS, it is recommended that the NEP jobs in the subsystem be ended in a controlled manner. The command (SETADMPGM) created expressly for the purpose may be used to end the NEP but, you can also cause the NEP to end by setting the \*EXIT function with the ADM control maintenance facility.

### **ADM Control File**

One of the key elements in the Automated Data Mover (ADM) system is the control file and control maintenance program.

The file is ADMCTLPF which is a general purpose control file used within the ADM system to direct processes to specific files, control the execution of programs, and provide default code values to programs within the scope of the ADM.

#### Field map for ADMCTLPF:

Field	Len	T	From	To	Nbr	D	Text
AMPRGM	10	Α	1	10			OBJECT - OPERATION
AMFUNC	10	Α	11	20			CONTROL FUNCTION
AMDESC	30	Α	21	50			CODE DESCRIPTION
AMDATA	128	Α	51	178			CONTROL DATA
AMDATE	8	S	179	186	8		Change Date
AMTIME	6	S	187	192	6		Change Time
AMUSER	10	Α	193	202			Change User

The keys to the file are the first two fields, AMPRGM and AMFUNC, the object and the function name. This provides more flexibility than hard-coding values within programs and allows the definitions of variable delay times, changeable default values for programs, and even variable process directives—such as where to archive IFS information.

#### **ADM Control Maintenance**

Maintenance of the control file is performed through the Work with Control application, ADM030RP. This simple maintenance facility will allow the user to add, change, or delete control entries.

This is designed as a tool for IT personnel as it provides function keys to work with the ADMSBS and manage ADM jobs.

QPADEVOOOM CROYS	ADM030RP 980100	Work With Contro	ls	\$100860D ADM030C2	
	ption, press e =Edit	nter. 4=Delete	Position to 5=View	:	_
		Descriptio		Val	lue
ADMDTAPF	XLATE	FILE TRANSLATE PG	М	ADM300RP	
ADM010CL	ARCHIVE	WEB ORDER ARCHIVE	FOLDER	/WEBARCHI\	/E
ADM010CL	DB2FILE	ADM DATA FILE		CROYS	ADMDTAPF
ADM010CL	DELAY	ADM010CL JOB DELA	Y SECONDS	060	
ADM010CL	EXIT	ADM EXIT REQUEST		NOEXIT	
ADM010CL	IMPORT	WEB ORDER IMPORT	FOLDER	/WEBORDERS	6
ADM010CL	ORD	IMPORT FILE TO DA	TABASE	ADMDTAPF	
ADM015CL				/WEBARCHI\	/F
ADM015CL		ADM DATA FILE	.,	CROYS	ADMDTAPF
	IMPORT		EOI DED	/WEBORDERS	
					•
ADM300RP				A	
ADM300RP	DFTTERMS	DEFAULT TERMS COD	E	07	
					More
F3	=Exit	F4=ADM Data	F5=Refre	sh	
F6	=Add control	F8=Work with A	DMSBS F24=More	Keys	

Since the application is operated by IT staff, a function key (F21) is provided to allow the user a command line entry. The command line entry (a call to QUSCMDLN) provides the user with the ability to issue system commands without leaving the program itself.

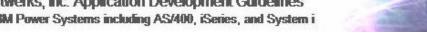
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Along with controls that allow a user to define where web orders are to be archived, and what IFS folder they come from, the maintenance program will also allow a user to set the delay time for the Never Ending Programs (NEP) that mange the data flow through the ADM.

```
QPADEV001D ADM030RP
                                                     S100860D 6/19/07
                      Work With Controls
CROYS 981398
                                                    ADM030C2 09:07:53
       : ADM035RP Change Control Entry ADM010CL DELAY ADM03501 :
                                                          View :
      : Control name....: ADM010CL
OP Ob : Function..... DELAY
___ ADMD : Description.....: ADM010CL JOB DELAY SECONDS
__ ADM0 : Data value.....: 060
__ ADM0 :
5 ADM0 :
__ ADM0 :
__ ADM0 :
____ ADMO : Last updated: CROYS 2007-06-15 8:42:48
__ ADMO :
__ ADMO : F3=Exit
__ ADMO :
__ ADM3 :
                                                                More...
        F3=Exit F4=ADM Data F5=Refresh
F6=Add control F8=Work with ADMSBS F24=More Keys
```

Setting the value of the DELAY function to 300 will cause the NEP program to go to sleep for five minutes, the next time it wakes and processes order information. In the example above the delay time is set to 060 (seconds) which means the NEP controlled By ADM010CL (ADM\_MOVER) will poll for order information every 60 seconds.

The control maintenance facility can also be used to set the NEP exit functions to EXIT, causing the NEP to quit.



#### ADM Data Flow



Fig. 2

The ADM data flow is straightforward. Any data source may feed information into the ADM system through the IFS. IFS data is typically ASCII data in a comma, space delimited or fixed record format.

The data is passed into the ADM via the data mover NEP. It is converted to EBCDIC format and stored in DB2/400 files, where it is examined for errors. This is an important step in the process. By translating the data to an intermediate format any errors can be corrected before the data is placed into production files. This insures that production data is "clean" and any subsequent data manipulation is kept to a minimum.

## Work with ADM Data

A program, (ADM040RP) has been created to support inquiry and maintenance of the order data within the ADM system. The initial screen is presented in a Common User Access (CUA) orientation with options at the top a list in the middle and functions at the bottom of the display.

•	981398		ith Order Ti	ransaction		S100860D 6	
Options-				error	4=Delete 8=Line items		
		Web ID				PO Number	
						40081, 40101	
						516stk	
X 02	14402161	0000000558	2007/05/24	11:20:29	00017763	2178	00043859
X 01	14402219	0000000550	2007/05/24	11:19:57	00017763	2169	00043860
X 02	14403128	0000000548	2007/05/24	11:19:59	00011056	3287A	00043861
X 02	14405370	0000000547	2007/05/24	11:20:00	00014767	40013	00043862
X 02	14406279	0000000545	2007/05/24	11:20:02	00017989	624-3131Lind	00043863
X 02	14407187	0000000543	2007/05/24	11:20:04	00006869	51207rm	00043864
X 01	14408096	0000000541	2007/05/24	11:20:06	00017763	2156	00043865
X 01	14409005	0000000539	2007/05/24	11:20:08	00008128	051107	00043866
X 01	14409913	0000000536	2007/05/24	11:20:10	00011234	jac5/10/07	00043867
X 02	14412639	0000000530	2007/05/24	11:20:16	00006576	27307	00043868
							More
	F3=Exit		F5=Refres	ר	F8=Mess	ages	
	F10=Move	e web orders	s F14=Web O	rders	F24=More	e Keys	

The input-capable fields at the top of each column function as a filter or sort for the data in the ADM system. For example the Web ID column may be used to position the data list to a web order ID. The list will be positioned closest to the value entered and the list will be sorted by web order ID. If a date entered field is entered, all transactions for that date and greater will be listed and the list will be organized by entry date.

This application also provides function keys to allow the inquiry into the Integrated File System (IFS) for a look at the original, transmitted data via the links for web orders and the web archive folders.

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The function to show the web order archive displays the IFS folder where the order data is archived. From this IBM supplied panel, the original order data may be displayed.

	Work with Obj	ect Links			
Directory : /WEB	ARCHIVE				
Type options, press Enter. 2=Edit 3=Copy 4=Remove 11=Change current director		7=Rename	8=Display	attributes	
Opt Object link  ORD608.xml ORD609.xml ORD610.xml ORD611.xml ORD612.xml ORD613.xml ORD613.xml ORD614.xml ORD614.xml ORD615.xml	Type Att STMF STMF STMF STMF STMF STMF STMF STMF	ribute Te:	×t		
Parameters or command				More	
F3=Exit F4=Prompt F5=Re F22=Display entire field		rieve F12= re options	Cancel F1	7=Position	to

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This information provides a view of the order information, from inception, that may be compared to customer invoice. Having the original order information can be important when attempting to correct an error in the ADM data.

Record	: /WEBARCHIVE/0 :1 of :	89	•		Column : <u>1</u>	5	9 by <u>131</u>
********* <pre> </pre> <pre> ********  <pre> </pre> <pre> <pre></pre></pre></pre>	.1+2 *****Beginning rsion="1.0"?> r> Header> tomerNum>17482< esman>9370107 > letin> pName>FURNITURE pAdd>3501 SPRIM	.+3. of data*: /customei sman> a>  DIREC /i G FOREST	*********  Num>  shipName> <th>idd&gt;</th> <th>6+7</th> <th>+</th> <th>.8+9+0+1+2+3.</th>	idd>	6+7	+	.8+9+0+1+2+3.
<p0></p0>	erCompany>01 <th>·</th> <th></th> <th>FAF Countries</th> <th>TAC Dancak Sind</th> <th>F40</th> <th>1.44 [00 0:14</th>	·		FAF Countries	TAC Dancak Sind	F40	1.44 [00 0:14
FJ=EX1₹	riw=visplay	nex F1.	z-cancet	LTD=26LATG62	- Fio-Kebear ilua	F19	=Left F20=Right



This application allows the user to view the order line items, the order header information and the ability to correct the order information.

Error tags will be set for any record that the ADM editor discovers in error. It can be simply missing information, or as in the example below, information that is not on file. Order header records in error will be flagged with the status code of 'E'.

#### **Header maintenance**

Fields that may be changed will be underlined and the color will be turquoise. The fields are not edited on entry, but will be edited by the ADM editor when wakes for processing, or the order may be immediately sent to the editor using the option (Check Order) provided on the Work with Order Transaction display.

```
QPADEV001D ADM045RP
                                                      S100860D 6/19/07
CROYS 981398
                                                      ADM045C2 10:26:30
                                                      Change
Company....: <u>02</u>
Customer....: 99999900 SMITH
                                                    Invoice:
                                                    Origin.: W
Ship to....: _
                                                    Error..: ADM0002
                                                    Created: 2007/06/15
Customer PO..: <u>Test1</u>
                                                            10:29:36
Salesman....: 215 Salesman not on file
                                                            CROYS
Ship category: A
Ship volume..:
                                                    Revised: 2007/06/19
Ship via....: 1 COMPANY TRUCK
                                                           10:26:10
CROYS
Ship zone...: <u>5</u>
Ship complete: Y
Commission rt:
Freight amt..: <u>186.00</u>
Item amount..: 1079.85
                         OPS code....: ____
Order total..: 1265.85
                          Bulletin....:
        F3=Exit ENTER=Update record F12=Cancel
```



Line item maintenance is very similar to the header maintenance process. Items in error will be flagged as errors and show a status code of 'E'.

```
      QPADEV001D ADM060RP
      $100860D 6/19/07

      CROYS
      981398
      Work With Items
      ADM060C2 10:27:12

      Customer...:
      99999900
      Seats....:

      Customer PO: Test1
      Cat/zone.: A 05

      Order ID...:
      524 Vol/via..: 01 ,

      Options--> 2=Edit item
      4=Delete item
      5=Display item

      T=Show error

      Op S Ln Frame Dsc Cover cl Cover cl Co Wh Qty Price Freight Total

      P 01 00030002
      01976 19 00000 00 04 00 001 259.95
      259.95

      P 02 00003001
      01976 19 00000 00 04 00 001 409.95
      409.95

      P 03 00030022
      01976 19 00000 00 04 00 001 409.95
      409.95
```

Bottom Total....: 1079.85 186.00 1265.85

F3=Exit F5=Refresh F12=Previous

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Individual line item entries may be changed with this maintenance program. All inputcapable fields will be underlined and appear in the color turquoise.

QPADEV001D ADM065RP S100860D 6/19/07 CROYS 981398 ADM065C2 10:27:29 Change Company....: 02 Customer....: 99999900 SMITH Invoice: Customer PO..: Test1 Origin.: W Order Co....: 02 Error..: Billing Co...: 02 Created: 20070615 Mfq Co....: 04 102936 Quantity....: \_\_1 CROYS Frame..... \_\_ Cover 1....: <u>1976</u> Revised: 20070619

 Color 1.....: 19
 102720

 Cover 2.....:
 CROYS

Express code:: 3281
Unit price...: 409.95
Unit freight:: \_\_\_\_\_\_
Commission rt: \_\_\_\_\_05

Color 2....:

F3=Exit ENTER=Update record F12=Cancel

As with the header information, the data is not edited at entry time but will be automatically edited when the editor NEP runs, or if the option (Check Order) is executed for the individual order.



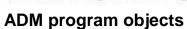
## **ADM file objects**

The following are file objects associated with the ADM system. The files listed below are defined in DDS, with the exception of the raw data file which is a simple flat file with a record length of 500 bytes.

Member	Type	Text	
ADMCMTPF	PF	ADM:	comments
ADMCTLPF	PF	ADM:	Automated Data Management
ADMDETPF	PF	ADM:	Order detail
ADMHDRL0	LF	ADM:	Header, select only '*'
ADMHDRL1	LF	ADM:	Header, select only 'E'
ADMHDRL2	LF	ADM:	Header, select only pending
ADMHDRL3	LF	ADM:	Header, select errors only
ADMHDRPF	PF	ADM:	Order header
ADM030DF	DSPF	ADM:	Control file maintenance display
ADM035DF	DSPF	ADM:	maintain control file entry
ADM040DA	DSPF	ADM:	conversion data list display
ADM040DF	DSPF	ADM:	conversion data list display
ADM040WF	PF	ADM:	Filter work file
ADM045DF	DSPF	ADM:	maintain header file entry
ADM060DF	DSPF	ADM:	conversion line list display
ADM065DF	DSPF	ADM:	maintain line item file entry
*no DDS			
ADMDTAPF	*FILE PF	ADM:	Raw data file

## **ADM** command objects

Member	Type	Text
SETADMPGM	CMD	Set ADM program
STRDTAMVR	CMD	Start Automated Data Mover
ENDDTAMVR	CMD	End Automated Data Mover



The following list of RPG members are associated with the ADM system. Most of the program objects are RPG programs, however there are several modules and objects with embedded SQL.

Member	Type	Text	
ADM000_PR	RPGLE	ADM:	Procedure prototypes
ADM005RM	SQLRPGLE	ADM:	Service modules
ADM005RP	RPGLE	ADM:	SP wrapper-find value by key
ADM006RP	RPGLE	ADM:	SP wrapper-find key by value
ADM010RP	RPGLE	ADM:	List directory to REXXQ
ADM020RP	RPGLE	ADM:	Read file list from REXXQ
ADM030RM	SQLRPGLE	ADM:	Service module for ADMHDRPF
ADM030RP	RPGLE	ADM:	Work with control file entries
ADM035RP	RPGLE	ADM:	control entry maintenance
ADM040_PR	RPGLE	ADM:	Procedure prototypes
ADM040RM	SQLRPGLE	ADM:	Header sort module
ADM040RP	RPGLE	ADM:	Work with translated entries
ADM041RP	RPGLE	ADM:	Format query
ADM042RP	RPGLE	ADM:	Filter manager
ADM045RP	RPGLE	ADM:	header file maintenance
ADM047RP	RPGLE	ADM:	header soft delete
ADM050RP	RPGLE	ADM:	Random number generator
ADM060RP	RPGLE	ADM:	list transmitted line items
ADM065RP	RPGLE	ADM:	item file maintenance
ADM100_PR	RPGLE	ADM:	Procedure prototypes
ADM100RM	RPGLE	ADM:	validity checker
ADM300RP	RPGLE	ADM:	XML parser
ADM325RP	RPGLE	ADM:	Splitter
ADM350RP	RPGLE	ADM:	Editor
ADM400RP	RPGLE	ADM:	Order translator
ADM405RP	RPGLE	ADM:	Get next invoice number

The following objects are CL programs are associated with the ADM system. ADM010CL, ADM350CL, and ADM400CL are designed to be used as NEP processes within the system.

Member	Type	Text
ADM010CL	CLP	ADM: data mover
ADM015CL	CLP	ADM: data mover II
ADM020CL	CLP	ADM: Move data from directory to directory
ADM030CL	CLP	ADM: Start data mover CPP
ADM040CL	CLP	ADM: start
ADM350CL	CLP	ADM: Call data editor
ADM400CL	CLP	ADM: Call data translation program