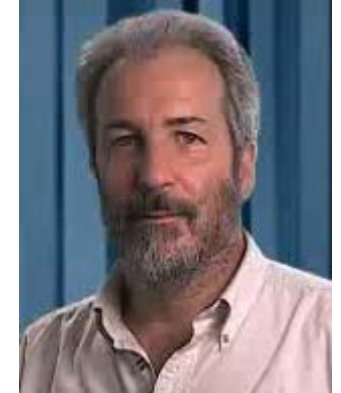


Living with Microsoft SQL Server in an IBM i Shop

Craig Pelkie
craig@web400.com



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What is Microsoft SQL Server?

- **Windows database management system**

- Originally developed by Sybase
- Microsoft / Sybase partnership through late 80's
- All Microsoft product since early 90's

- **Versions and Editions**

- Early (obsolete) versions:
 - SQL Server 6.5
 - SQL Server 7
 - SQL Server 2000
- Current versions:
 - SQL Server 2005
 - **SQL Server 2008**
 - **SQL Server 2008 R2**
- Editions
 - SQL Server CE (Compact Edition) – used for embedded applications
 - **SQL Server Express** – no charge edition (does not include Analysis Services, Integration Services)
 - SQL Server Web – used for web servers
 - SQL Server Workgroup – used for small-office workgroups
 - SQL Server Standard – used for SMB
 - SQL Server Developer – contains all features of Enterprise, licensed only for development
 - **SQL Server Enterprise** – also available in Evaluation Edition (180 day limit)

Primary reference:

<http://www.microsoft.com/sql>

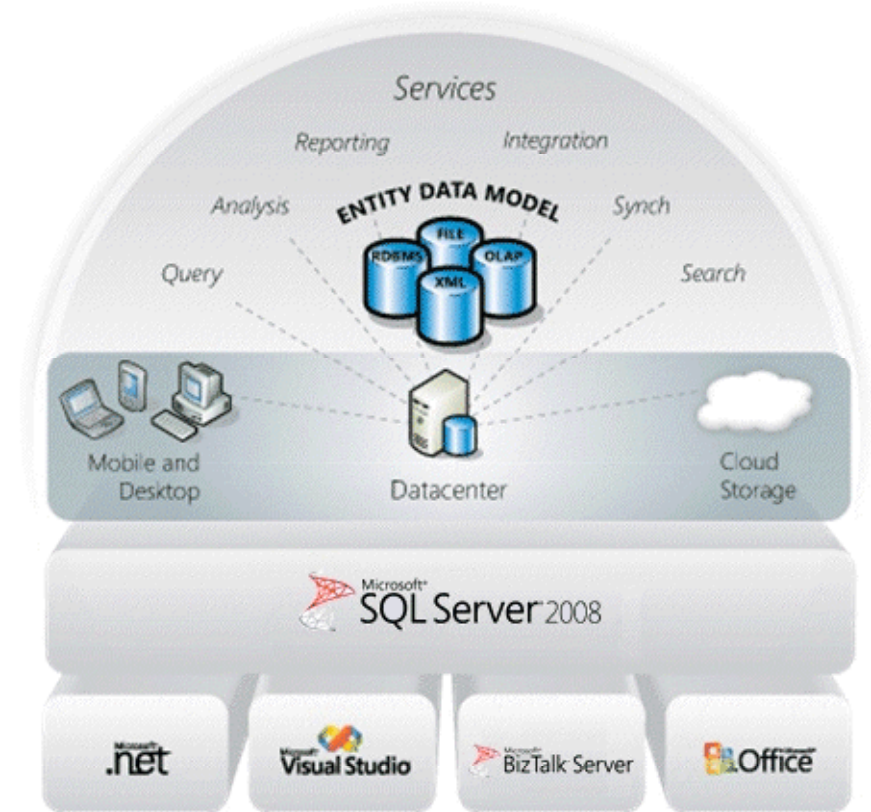
SQL Server Features

- **SQL Server Database Services**

- Core database engine
- Replication – distribute data to multiple databases

- **SQL Server Analysis Services (SSAS)**

- Online Analytical Processing (OLAP)
- Data mining / Business Intelligence



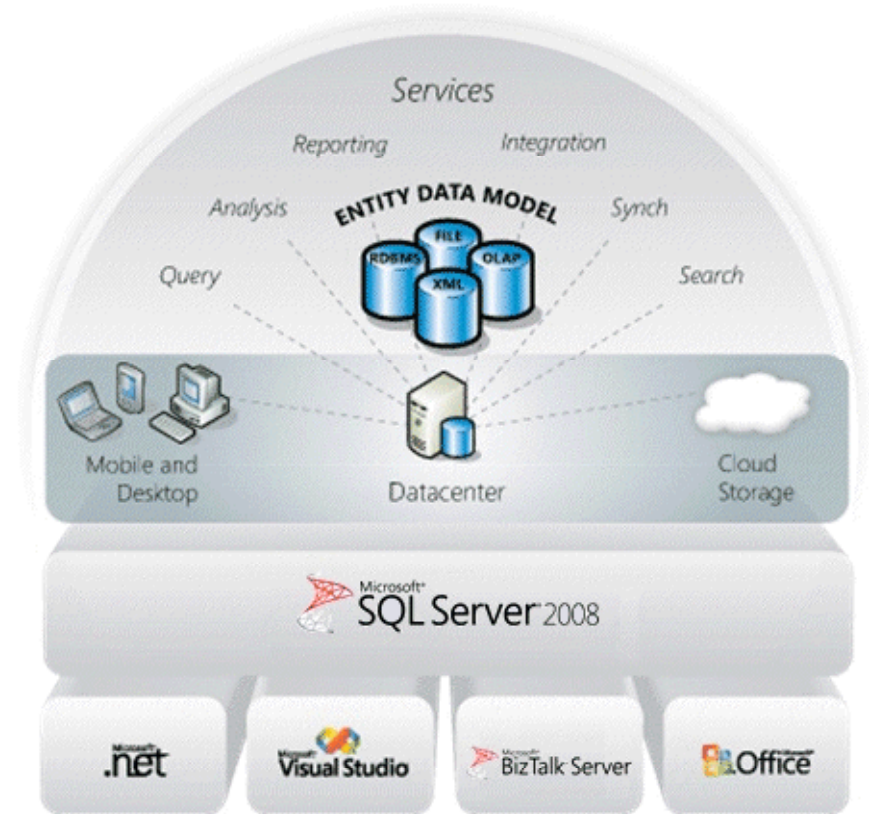
SQL Server Features

- **SQL Server Reporting Services (SSRS)**

- Report Manager / Report Server
- Create / Manage / Distribute reports
- Web option for distribution

- **SQL Server Integration Services (SSIS)**

- Extract / Transform / Load (ETL) processing
- Integrate data from multiple sources / to multiple destinations
- **Express Edition** – can run but not create SSIS packages



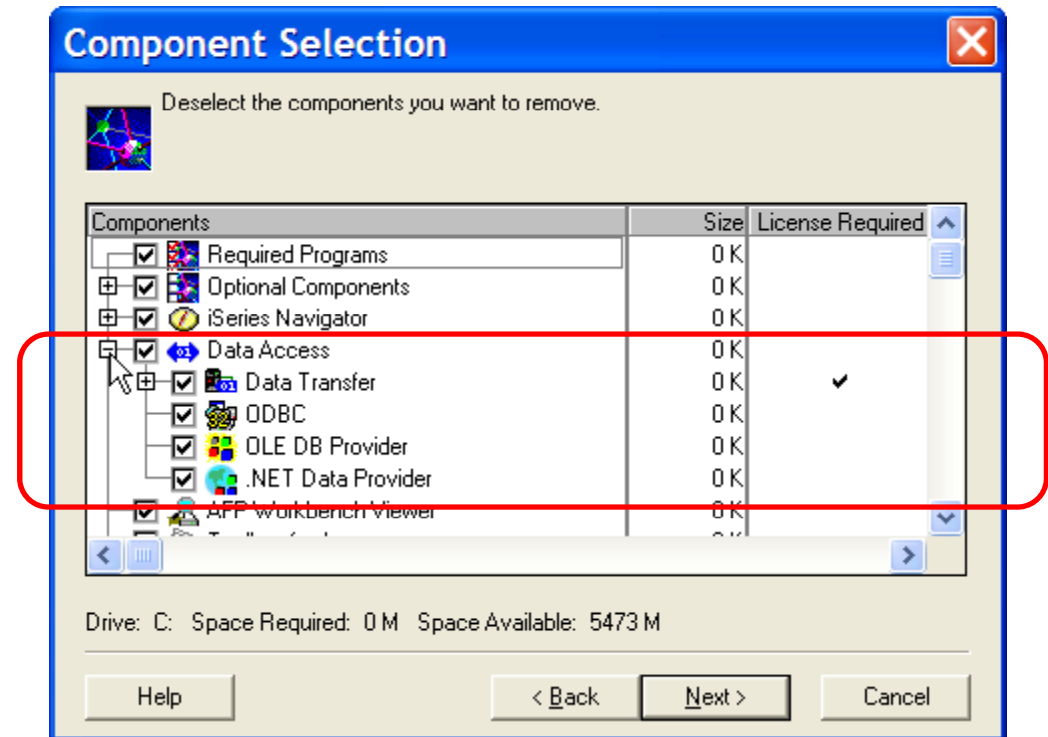
Connection Options, IBM i Access for Windows

- **IBM i Access for Windows**

- Licensed Program Products
 - 57xx-XW1 – IBM i Access Family
 - 57xx-XE1 – IBM i Access for Windows

- These providers are no-charge components of IBM i Access
- Can be installed independently of other IBM i Access components
- 3 OLE DB Providers are installed:
 - IBMDA400** – SQL support
 - IBMDARLA** – Record Level Access
 - IBMDASQL** – SQL, transactions

Provider	IBM i Access VRM
ODBC	V5R1 +
OLE DB	V5R1 +
.NET	V5R3 +



Direct connection to IBM i using IBMDA400 OLE DB Provider

The screenshot shows Microsoft SQL Server Management Studio with a query window containing the following SQL code:

```
select * from Openrowset('IBMDA400', 'M270'; 'QUSER'; 'QUSER', 'SELECT * FROM QIWS.QCUSTCDT')
```

A callout box highlights the SQL code:

```
SELECT * FROM OPENROWSET(  
    'IBMDA400', 'M270'; 'QUSER'; 'QUSER',  
    'SELECT * FROM QIWS.QCUSTCDT'  
)
```

The Results pane shows the following data:

	CUSNUM	LSTNAM	INIT	STREET	CITY	STATE	ZIPCOD	CDTLMT	CHGCOD	BALDUE	CTDUE
1	938472	Henning	G K	4859 Elm Ave	Dallas	TX	75217	5000	3	37.00	0.00
2	839283	Jones	B D	21B NW 135 St	Clay	NY	13041	400	1	100.00	0.00
3	392859	Vine	S S	PO Box 79	Broton	VT	5046	700	1	439.00	0.00
4	938485	Johnson	J A	3 Alpine Way	Helen	GA	30545	9999	2	3987.50	33.50
5	397267	Tyron	W E	13 Myrtle Dr	Hector	NY	14841	1000	1	0.00	0.00
6	389572	Stevens	K L	208 Snow Pass	Denver	CO	80226	400	1	58.75	1.50
7	846283	Alison	J S	787 Lake Dr	Isle	MN	56342	5000	3	10.00	0.00
8	475938	Doe	J W	59 Archer Rd	Sutter	CA	95685	700	2	250.00	100.00
9	693829	Thomas	A N	3 Dove Circle	Casper	WY	82609	9999	2	0.00	0.00
10	593029	Williams	E D	485 SE 2 Ave	Dallas	TX	75218	200	1	25.00	0.00

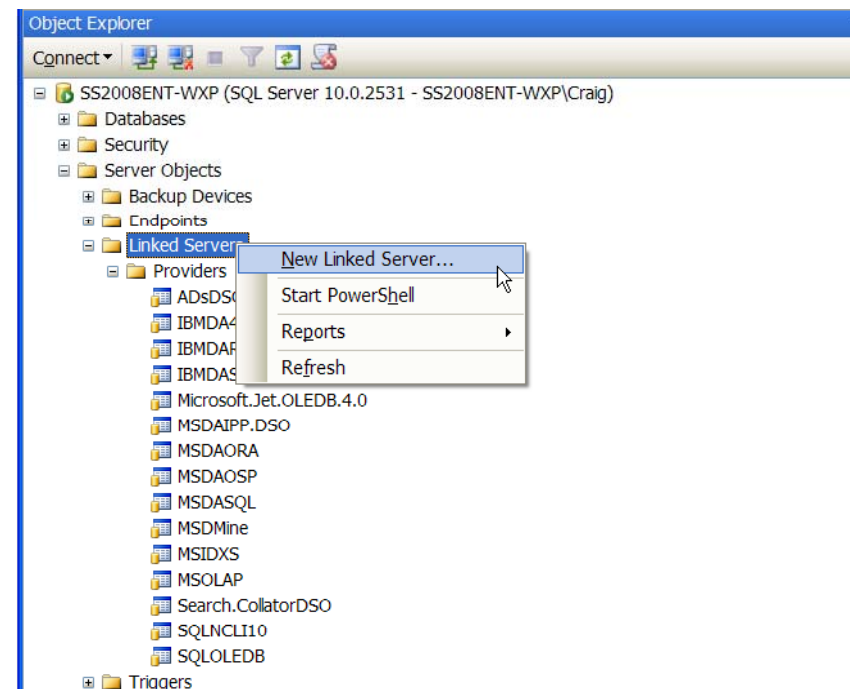
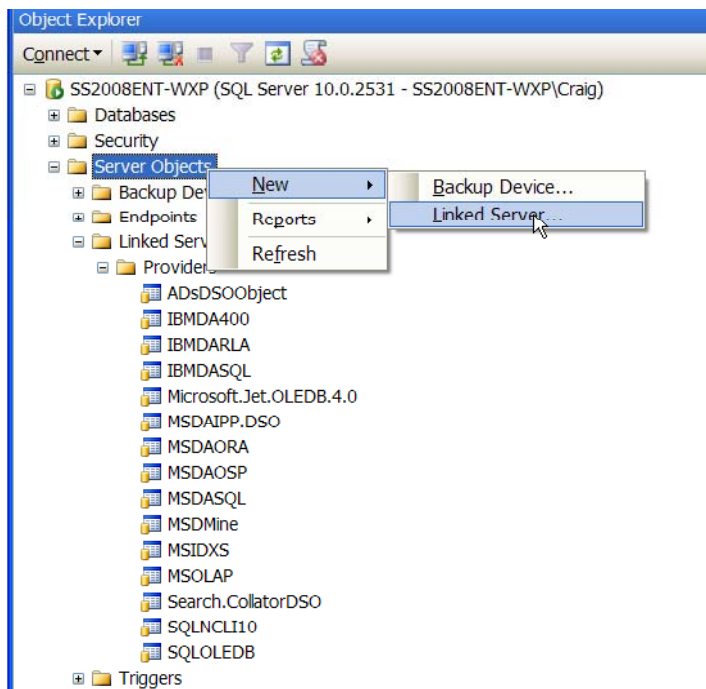
Query executed successfully. SS2008ENT-WXP (10.0 SP1) SS2008ENT-WXP\Craig (52) master 00:00:00 12 rows

This is the SQL Server Management Studio. You can use it to develop and run queries, both in SQL Server and connected to your IBM i (as shown here).

SQL Server – Create a Linked Server

• Linked Server

- Persistent object in SQL Server
- Represents a connection to another data source
 - Can be to another SQL Server
 - Can be to another type of database server that has an OLE DB Provider
 - OLE DB Provider is installed on the server where SQL Server is installed



Configure the Linked Server

Name that will be used within SQL Server for the Linked Server

Select the IBMDA400 Provider

(any value)

TCP/IP Host Name of IBM i to link to

Valid Provider String for IBMDA400

<http://www.connectionstrings.com>

This is the entire provider string.

OK Cancel

Populate a table in SQL Server with SELECT INTO from a Linked Server table

The screenshot displays the Microsoft SQL Server Management Studio interface. The Object Explorer on the left shows the server structure, including the 'SQL400' database and its 'dbo.QCUST' table. The main window shows a SQL query in a query editor, which has been executed successfully. The query is as follows:

```
use [SQL400];
GO
--DROP table SQL400.dbo.QCUST;
L--GO
select cusnum, lstnam, init, street, city, state, zipcod
into SQL400.dbo.QCUST
from M270.S105HMNM.ADVWORKS.QCUSTCDT
```

The execution results show that 12 rows were affected. A callout box highlights the query text, with red lines pointing to the Object Explorer and the query editor to identify the components of the query:

- Server name (TCP/IP Host Name):** M270
- RDB name (WRKRDBDIRE):** S105HMNM
- Library name:** ADVWORKS
- Table name:** QCUSTCDT

The status bar at the bottom indicates that the query was executed successfully on the SQL400 database, with 0 rows returned.

Update data on the IBM i from SQL Server – how it's done

SQLQuery10.sql...XP\Craig (58))*

SQLQuery19.sql ...WXP\Craig (56)

```
update M270.S105HMNM.ADVWORKS.QCUSTCDT  
set city='PARIS'  
where cusnum=938472
```

```
UPDATE M270.S105HMNM.ADVWORKS.QCUSTCDT  
SET CITY='PARIS'  
WHERE CUSNUM=938472
```

Contents of ADVWORKS.QCUSTCDT - M270(S105hmm)

	CUSNUM	LSTNAM	INIT	STREET	CITY	STATE	ZIPCOD	CDTLMT	CHGCOD	BALDUE	CDTDUE
1	938472	Henning	G K	4859 Elm Ave	PARIS	TX	75217	5000	3	37.00	0
2	839283	Jones	B D	21B NW 135 St	Clay	NY	13041	400	1	100.00	0
3	392859	Vine	S S	PO Box 79	Broton	VT	5046	700	1	439.00	0
4	938485	Johnson	J A	3 Alpine Way	Helen	GA	30545	9999	2	3987.50	33.50
5	397267	Tyron	W E	13 Myrtle Dr	Hector	NY	14841	1000	1	0	0
6	389572	Stevens	K L	208 Snow Pass	Denver	CO	80226	400	1	58.75	1.50
7	846283	Alison	J S	787 Lake Dr	Isle	MN	56342	5000	3	10.00	0
8	475938	Doe	J W	59 Archer Rd	Sutter	CA	95685	700	2	250.00	100.00
9	693829	Thomas	A N	3 Dove Circle	Casper	WY	82609	9999	2	0	0
10	593029	Williams	E D	485 SE 2 Ave	Dallas	TX	75218	200	1	25.00	0
11	192837	Lee	F L	5963 Oak St	Hector	NY	14841	700	2	500.00	.50

Saving a script in SQL Server

SQLQuery10.sql...XP\Craig (58))* | SQLQuery19.sql ...WXP\Craig (56)

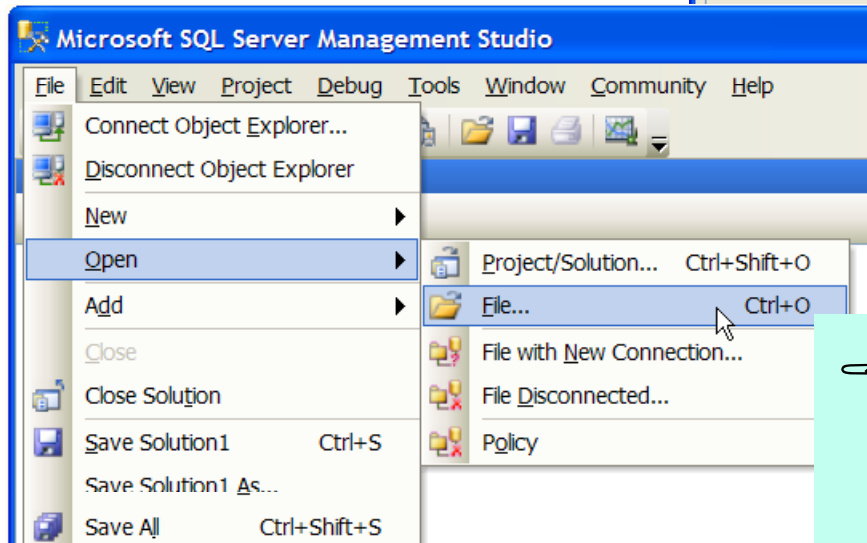
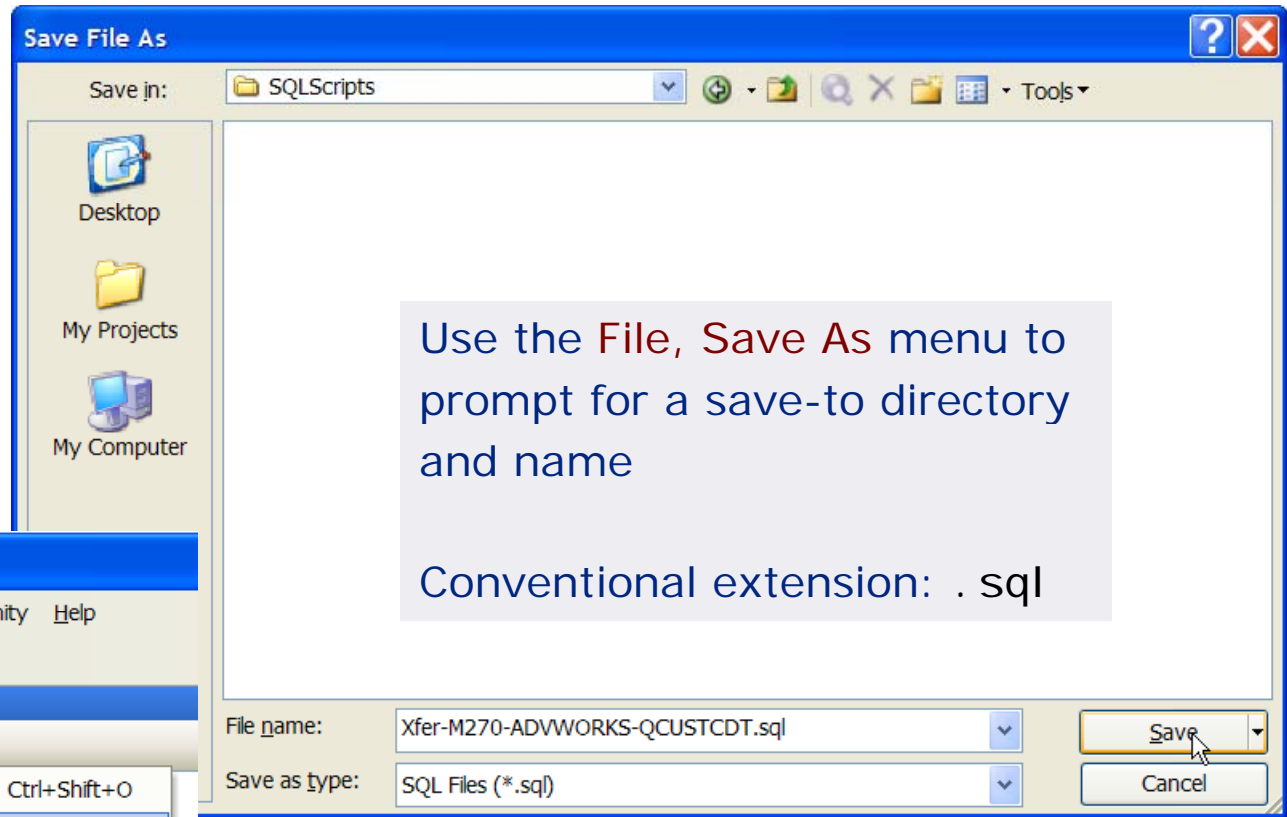
```
use [SQL400];  
GO
```

```
DROP table SQL400.dbo.QCUST;  
GO
```

```
select cusnum, lstnam, init, street, city,  
into SQL400.dbo.QCUST  
from M270.S105HMNM.ADVWORKS.QCUSTCDT
```



The script to be saved



You can open the saved script file in SQL Server Management Studio. Click the Execute button to run it.

Work with the SQL Server Agent

The screenshot shows the 'Job Properties' dialog box for a job named 'Load_ADVWORKS_QCUST'. The 'General' tab is selected, showing the job's name, owner, category, and description. The description is 'Load linked server table ADVWORKS/QCUST from SQL400.dbo.QCUST'. The 'Connection' section shows the server 'SS2008-IAW61-07' and the connection 'SS2008-IAW61-07\Craig'. The 'Progress' section shows the job is 'Ready'. The 'Created' date is 6/15/2009 3:05:52 AM, 'Last modified' is 6/15/2009 4:09:01 AM, and 'Last executed' is 6/15/2009 4:08:00 AM. There are 'OK' and 'Cancel' buttons at the bottom.

The screenshot shows the 'Job Schedule Properties' dialog box for the same job. The 'Name' is 'Load_ADVWORKS_QCUST'. The 'Schedule type' is 'Recurring' and is 'Enabled'. The 'One-time occurrence' section shows a date of 6/15/2009 and a time of 4:37:05 AM. The 'Frequency' section shows 'Occurs' as 'Daily' and 'Rekurs every' as '1 day(s)'. The 'Daily frequency' section shows 'Occurs every' as '2 minute(s)' starting at '12:00:00 AM' and ending at '11:59:59 PM'. The 'Duration' section shows a 'Start date' of 6/15/2009 and 'No end date' selected. The 'Summary' section shows a description: 'Occurs every day every 2 minute(s) between 12:00:00 AM and 11:59:59 PM. Schedule will be used starting on 6/15/2009.' There are 'OK', 'Cancel', and 'Help' buttons at the bottom.

The SQL Server Agent is used to describe "jobs" to be run by SQL Server. It includes a Job Schedule feature that can be used to run SQL tasks.

What is SSRS used for?

- **Managed Reporting**
 - Recurring reports
 - Often collation of data from multiple data sources
- **Ad-Hoc Reporting**
 - Typically end-user driven
 - Generally one-time, relatively simple, time-dependent
- **Embedded Reporting**
 - Reports embedded within business apps / portals
 - Examples
 - Reports linked to SharePoint Server
 - Reports output to Excel

A Sample Report

Order Date	Customer ID	Category	Product ID	Product Name	Sales Order ID	Order Qty	Line Total	
Jun 01, 2004	29568 Coalition Bike Company	Handlebars	808	LL Mountain Handlebars	71899	1	26.72	
			Category Total					
		Jerseys	714	Long-Sleeve Logo Jersey, M	71899	2	59.99	
			881	Short-Sleeve Classic Jersey, S	71899	2	64.79	
			Category Total					
		Mountain Bikes	981	Mountain-400-W Silver, 40	71899	1	461.69	
			988	Mountain-500 Silver, 52	71899	1	67.80	
			Category Total					
		Mountain Frames	743	HL Mountain Frame - Black, 42	71899	1	809.76	
			944	LL Mountain Frame - Silver, 40	71899	2	316	
			Category Total					
		Pedals	937	HL Mountain Pedal	71899	1	48	
			Category Total					
		Customer Total						
29584 Futuristic Bikes	Jerseys	715	Long-Sleeve Logo Jersey, L	71895	2	59		
		Category Total						59
	Saddles	909	ML Mountain Seat/Saddle	71895	2	46.97		
		Category Total						46.97
	Vests	864	Classic Vest, S	71895	3	114.30		
		Category Total						114.30
Customer Total							221.26	
29612 Channel Outlet	Bike Racks	876	Hitch Rack - 4-Bike	71885	3	216.00		
		Category Total						216.00
	Jerseys	881	Short-Sleeve Classic Jersey, M	71885	6	184.26		

This is a typical list-style report.

It can be output to several different output types.

Report Delivery – File formats

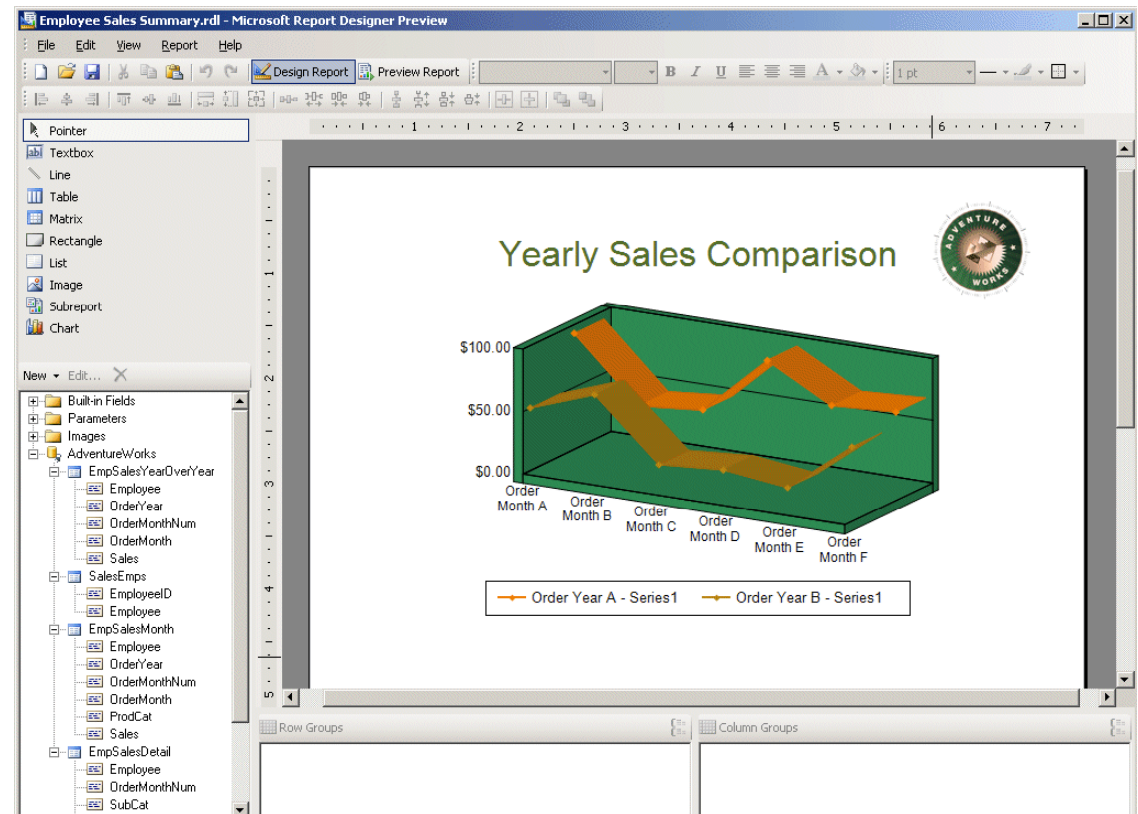
- SSRS can render into:
 - HTML
 - PDF
 - CSV
 - XML
 - Image (TIFF)
 - Microsoft Office Word
 - Microsoft Office Excel
- Reports rendered into Word / Excel are fully editable documents, users can create custom documents based on the report
- Reports can also be **emailed** from SSRS as a file attachment of one of the supported file formats

Advanced Report Features – Graphing / Charting

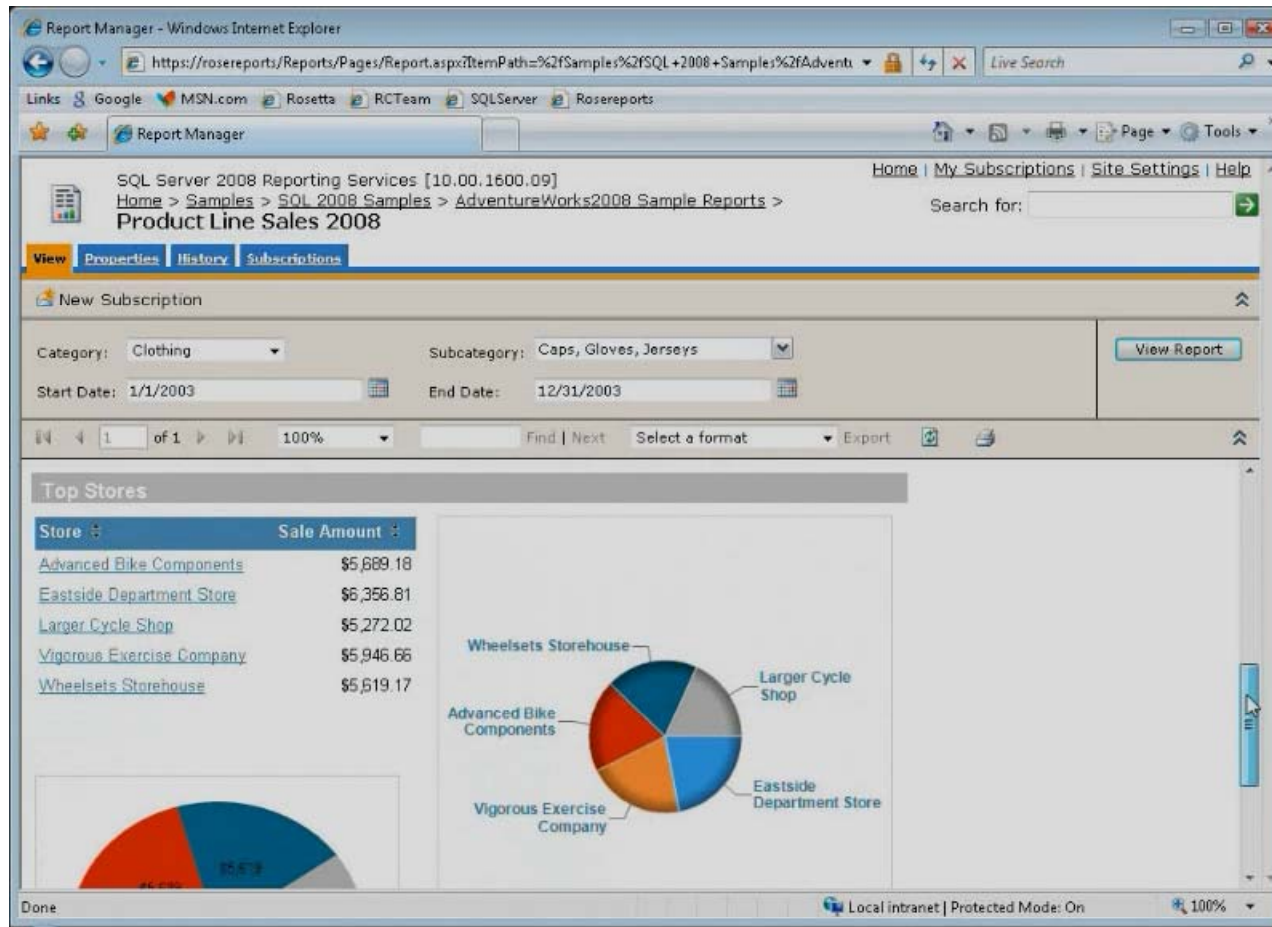
SSRS includes extensive graphing and charting tools.

In addition to traditional "list" styles of reports, report data can also be presented in graphical format.

In some report presentations, the graph is "live". It interacts with user mouse clicks to support drill-down into the underlying data.



Advanced Report Features – Summary data / graph / parameters on same report



This shows a composite report that includes

- Parameters
- Summarized data
- Graphs

The summarized data and graphs can be drilled-into to show the backing detail data.

What is SSIS used for?

- Historically known as Data Transformation Services (DTS)
 - SQL Server 7.0, SQL Server 2000
 - SSIS first released with SQL Server 2005
- Data Import / Export
 - Flat file / database -> database / flat file
- Extract, Transform, Load (ETL)
 - Typically associated with database -> data warehouse
 - Transform, clean, de-dupe, data conformance
- Control Flow Engine
 - Control sequential / scripted execution of sequence of events
 - Supports conditional processing, error handling
 - Examples
 - Download / upload
 - Rename, drop, create, index builds, backup

SSIS Package – Data Flow tasks

SSIS Package includes 1..n Control Flow tasks

Dependencies between tasks can be set

Example: Task 1 must complete successfully before Task 2 runs

Integration Services Project2 - Microsoft Visual Studio

Control Flow Items

- Pointer
- For Loop Container
- Foreach Loop Container
- Sequence Container
- ActiveX Script Task
- Analysis Services Execute DDL Task
- Analysis Services Processing Task
- Bulk Insert Task
- Data Flow Task
- Data Mining Query Task
- Data Profiling Task
- Execute DTS 2000 Package Task
- Execute Package Task
- Execute Process Task
- Execute SQL Task
- File System Task
- FTP Task
- Message Queue Task
- Script Task
- Send Mail Task
- Transfer Database Task
- Transfer Error Messages Task
- Transfer Jobs Task
- Transfer Logins Task
- Transfer Master Stored Procedures T...
- Transfer SQL Server Objects Task
- Web Service Task
- WMI Data Reader Task

Control Flow

DF1-Copy SQL to IBM i

FTP-From IBM i to SQL

Send Mail Task

Properties

Package Package

ForcedExecutionValu Int32

ForceExecutionValu False

Identification

CreationDate 6/23/2009 1:15 AM

CreatorComputerNa SS2008-IAW61-O7

CreatorName SS2008-IAW61-O7

Package ID {1181174F-BA3...}

Package Type DTSDesigner100

Package Executions (Collection)

Package Executions

Package ExecutionResu None

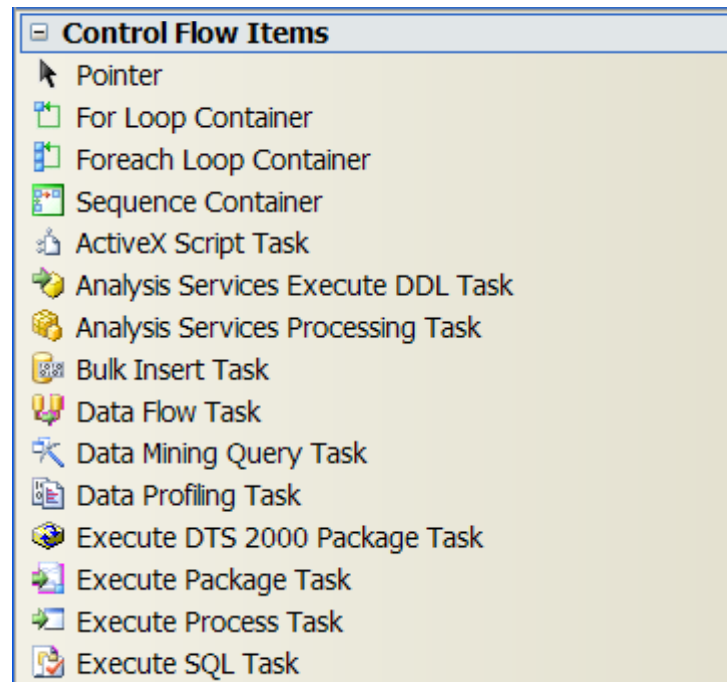
Package ID English (United Stat

Package LogMode UseParentSetting

Package the name of the object.

SSIS – Control Flow Items

General idea: used to define how an Integration Services task is to be accomplished, identifies the "main players" used in a task



Workflow Tasks

Execute...
File System
Send Mail
FTP
Message Queue
Web Services
WMI

Data Processing Tasks

Bulk Insert
XML
Data Profiling
Data Flow
Data Mining

Scripting Tasks

ActiveX
For / Sequence
Script

SQL Server Tasks

Transfer...
Analysis Services...

Summary

If you don't already have SQL Server in your shop

Or if you are working with an older version (SS 7, SS 2000)

Consider downloading the SQL Server 2008 Express edition

Download the no-charge, no-registration PDF from Microsoft

Introducing Microsoft SQL Server R2

<http://go.microsoft.com/fwlink/?LinkID=189147>

Downloads for IBM i Access for Windows

http://www.web400.com/ibmi/Verify_IBMiAccess_v5rx.pdf

http://www.web400.com/ibmi/Verify_IBMiAccess_v6rx.pdf