

Microsoft SQL Server Features that can be used with the IBM i

Gateway/400 User Group
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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**
- **Soon: SQL Server 2012**

- Editions

- SQL Server CE (Compact Edition) – used for embedded applications
- **SQL Server Express** – no charge edition (does not include Analysis Services, Integration Services, Agent)
- 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

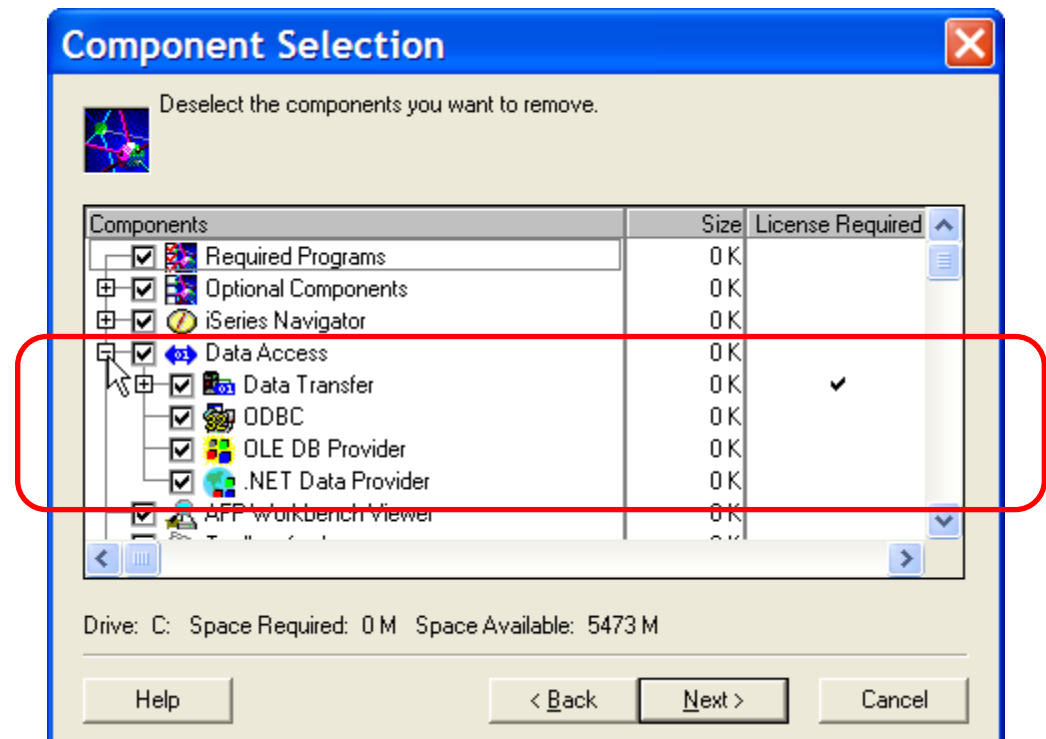


Connection Options, IBM i Access for Windows

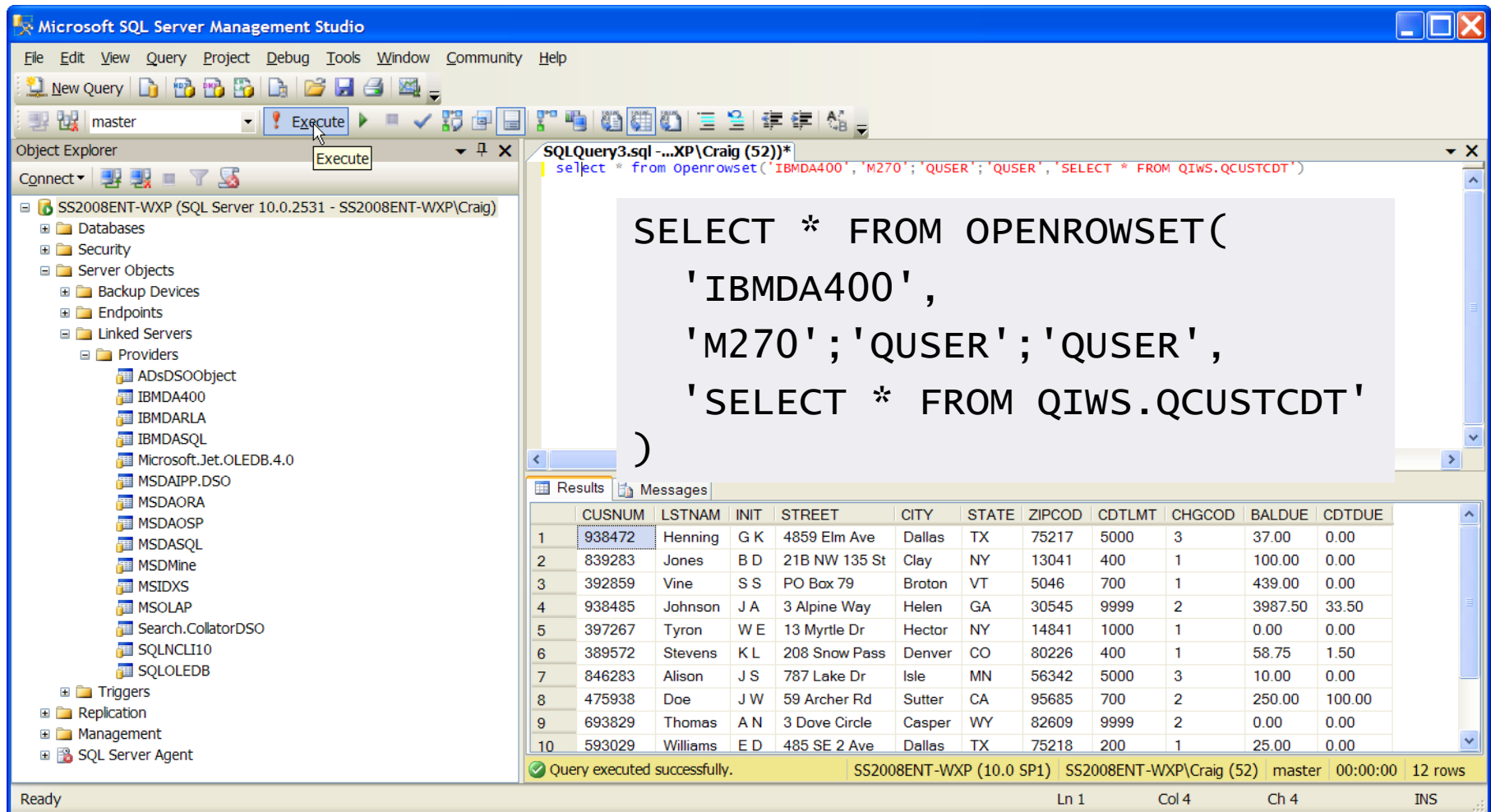
• IBM i Access for Windows

- 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 the Microsoft SQL Server Management Studio interface. The Object Explorer on the left displays the server hierarchy for 'SS2008ENT-WXP (SQL Server 10.0.2531 - SS2008ENT-WXP\Craig)', with the 'Providers' folder expanded to show 'IBMDA400'. The main window displays a SQL query in the 'SQLQuery3.sql' editor:

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

The query results are displayed in a table with the following columns: CUSNUM, LSTNAM, INIT, STREET, CITY, STATE, ZIPCOD, CDTLMT, CHGCOD, BALDUE, and CDTDUE. The results show 10 rows of customer 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

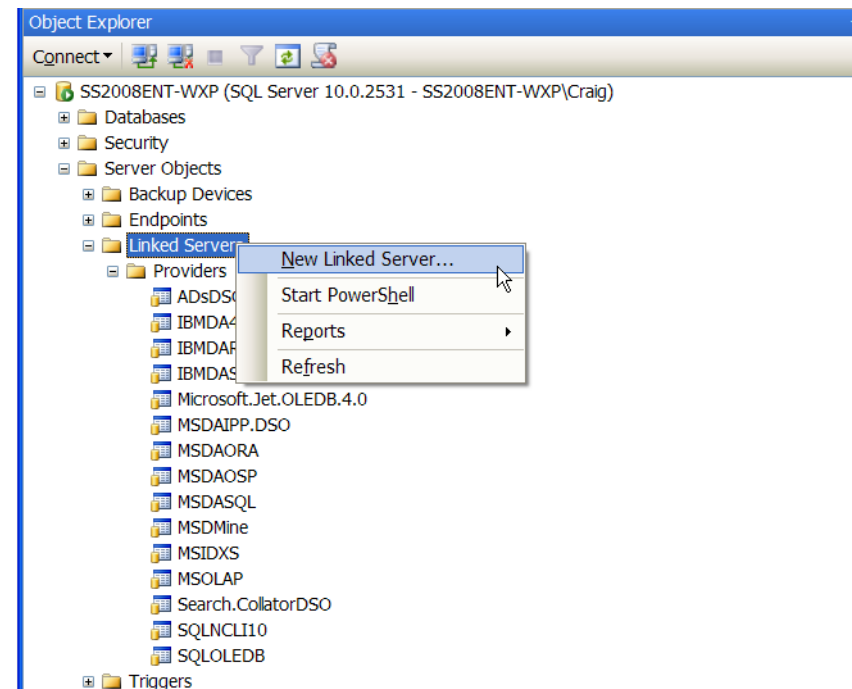
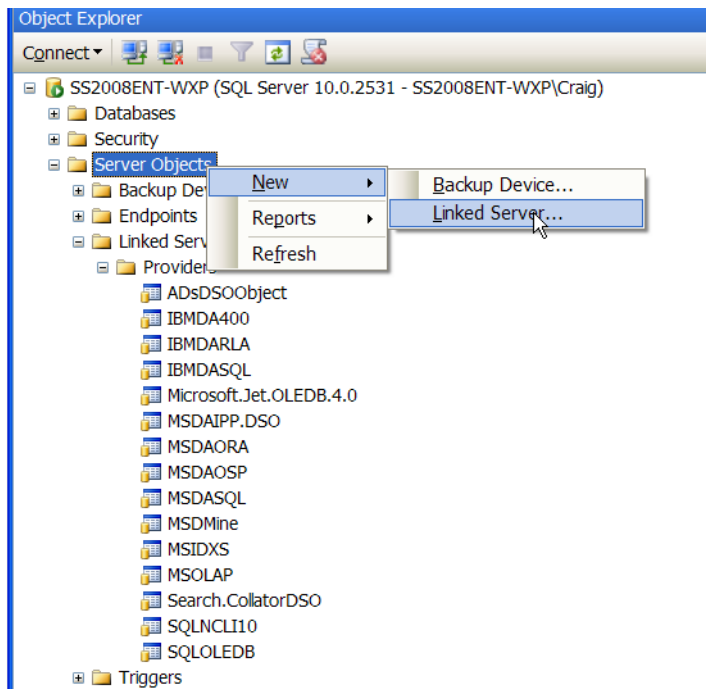
The status bar at the bottom indicates: Query executed successfully. SS2008ENT-WXP (10.0 SP1) SS2008ENT-WXP\Craig (52) master 00:00:00 12 rows

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 shows Microsoft SQL Server Management Studio (SSMS) with a SQL query window open. 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 Object Explorer on the left shows the server structure, with the table `dbo.QCUST` highlighted under the `SQL400` database. The table columns are:

- `cusnum` (numeric(6,0), not null)
- `lstnam` (varchar(8), not null)
- `init` (varchar(3), not null)
- `street` (varchar(13), not null)
- `city` (varchar(6), not null)
- `state` (varchar(2), not null)
- `zipcod` (numeric(5,0), not null)

The query results pane shows "(12 row(s) affected)". A status bar at the bottom indicates "Query executed successfully." and "SS2008ENT-WXP (10.0 SP1) SS2008ENT-WXP\Craig (52) SQL400 00:00:01 0 rows".

Annotations with red arrows point to the following parts of the query:

- SELECT CUSNUM, LSTNAM, INIT, STREET**: Points to the columns being selected.
- INTO SQL400.dbo.QCUST**: Points to the target table name.
- FROM M270.S105HMNM.ADVWORKS.QCUSTCDT**: Points to the source table name.

Labels below the query identify the components:

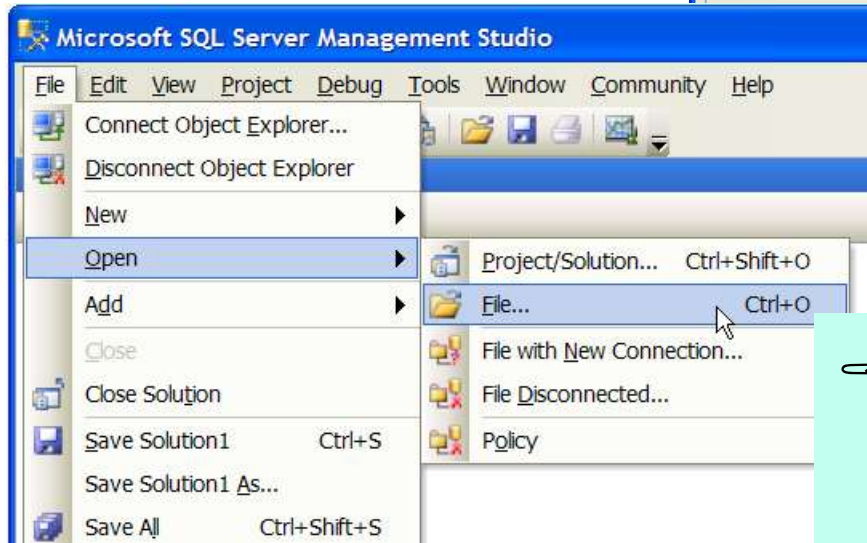
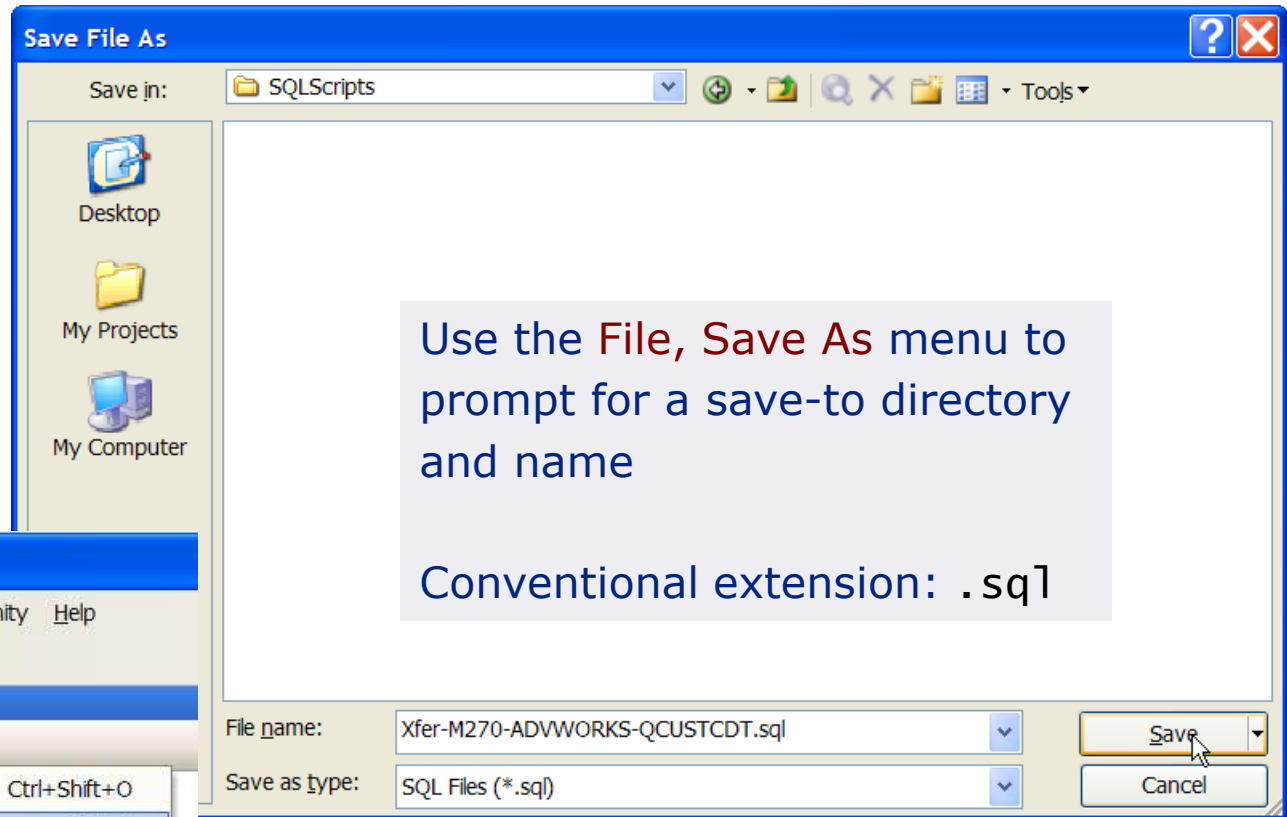
- Table name**: Points to `dbo.QCUST`
- Library name**: Points to `ADVWORKS`
- RDB name (WRKRDBDIRE)**: Points to `S105HMNM`
- Linked Server name**: Points to `M270`


Saving a script in SQL Server

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

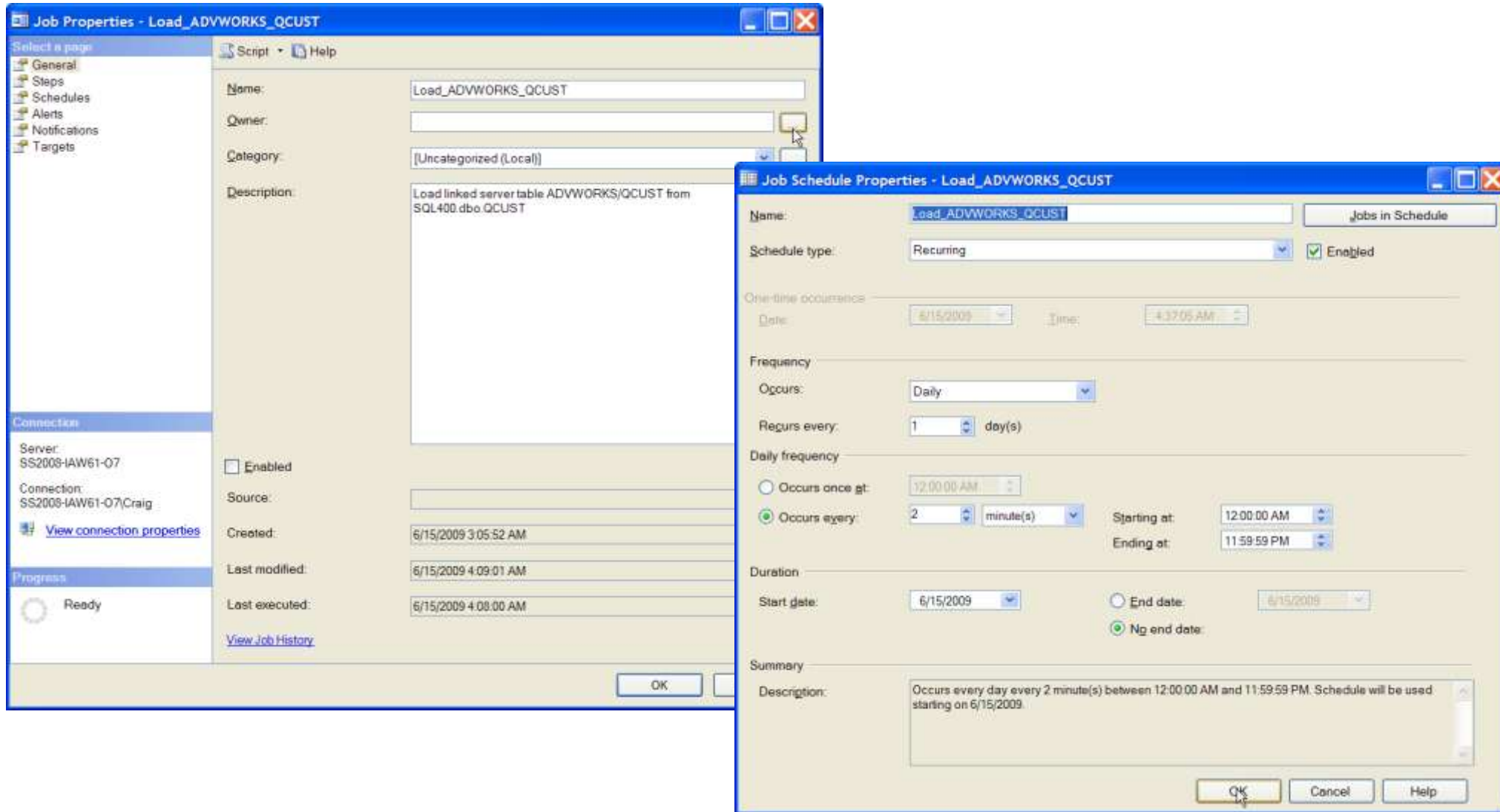
```
use [SQL400];  
GO  
  
DROP table SQL400.dbo.QCUST;  
GO  
  
select cusnum, l1stnam, init, street, city,  
into SQL400.dbo.QCUST  
from M270.S105HMNM.ADVWORKS.QCUSTCDT
```

 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 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.

Use the SQLCMD command to run a script

The `sqlcmd` command can be used to run a script file. The syntax for the command is:

```
sqlcmd -S server_name\instance_name -i c:\script_file_name.sql
```


where

`-S` identifies the following values as the server name and instance name
`server_name` - name of the SQL Server where the script is to be run

`instance_name` - is the instance of the SQL Server

`-i` identifies the following value as the name of the input file (the script)

`c:\script_file_name.sql` is the complete path and file name of the script file



```
Command Prompt
C:\>sqlcmd -S SS2008R2-ENT -i c:\SQLScripts\Load_ADVWORKS_QCUST.sql
```

The Microsoft SQL Server JDBC driver

- No-charge download from Microsoft

<http://msdn.microsoft.com/en-us/sqlserver/aa937724/>

(or go to Microsoft.com, search for "SQL Server JDBC")

- Download

Microsoft SQL Server JDBC Driver 3.0

`sqljdbc.jar` - Java 1.x, Java 5

`sqljdbc4.jar` - requires Java 6.0

- Install the .jar file to a directory in the IFS
- Set CLASSPATH to the .jar

Connect from IBM i using the JDBC Driver

```
private static ResultSet createResultSet(String customer) {  
  
    ResultSet rs = null;  
  
    try {  
        Properties p = new Properties();  
        p.put("user", "SQLTEST");  
        p.put("Password", "sqltest");  
        p.put("DatabaseName", "Northwind");  
  
        conn = DriverManager.getConnection(  
            "jdbc:sqlserver://host_name:1433", p);  
  
        stmt = conn.createStatement();  
  
        rs = stmt.executeQuery("SELECT * FROM Northwind.dbo.Customers");  
    }  
  
    catch (Exception e) {  
        System.err.println("Exception: " + e.getMessage());  
        System.exit(EXIT_ERROR);  
    }  
  
    return rs;  
}
```

Connect to SQL Server from RPG

- Primary reference:
 - Scott Klement's work and articles on System iNetwork
 - www.systeminetwork.com
 - Search for JDBC4
- How it works
 - Download / install JDBC driver from Microsoft
 - Download / install Scott's service program code, examples
 - Configure Java environment
 - Create RPG programs using the service program

Connect to SQL Server from RPG

- Another tool:
 - Dieter Bender's AppServer4RPG and ArdGate (Application Request Driver)
 - sourceforge.net/projects/appserver4rpg
 - Also uses JDBC driver
- How it works
 - Download / install JDBC driver from Microsoft
 - Download / install AppServer4RPG code, samples
 - Configure Java environment
 - Create RPG programs using ArdGate API

What is SQL Server Reporting Services 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

SalesOrders.rdl - Report Preview

4 of 5 ? Find | Next

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	316.86	
			Category Total					
		Pedals	937	HL Mountain Pedal	71899	1	48.59	
				Category Total				
		Customer Total						
	29584 Futuristic Bikes	Jerseys	715	Long-Sleeve Logo Jersey, L	71895	2	59.99	
			Category Total					
		Saddles	909	ML Mountain Seat/Saddle	71895	2	46.97	
			Category Total					
		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					
		Jerseys	881	Short-Sleeve Classic Jersey, M	71895	2	104.26	

This is a typical list-style report.

It can be output to several different output types.

Report Features – Summary data / graph / parameters

SQL Server 2008 Reporting Services [10.00.1600.09]
Home > Samples > SQL 2008 Samples > AdventureWorks2008 Sample Reports >
Product Line Sales 2008

View Properties History Subscriptions

New Subscription

Category: Clothing Subcategory: Caps, Gloves, Jerseys View Report

Start Date: 1/1/2003 End Date: 12/31/2003

1 of 1 100% Find | Next Select a format Export

Top Stores

Store	Sale Amount
Advanced Bike Components	\$5,689.18
Eastside Department Store	\$6,356.81
Larger Cycle Shop	\$5,272.02
Vigorous Exercise Company	\$5,946.66
Wheelsets Storehouse	\$5,619.17

Wheelsets Storehouse
Advanced Bike Components
Vigorous Exercise Company
Larger Cycle Shop
Eastside Department Store

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 SQL Server Integration Services 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..many Control Flow tasks

Dependencies between tasks can be set

Example: Task 1 must complete successfully before Task 2 runs

Microsoft SQL Server Features

SQL Server Lab

- Lab handout (PDF) provided for today's presentation
- Requires SQL Server Express Edition or any of the other SQL Server editions
 - SQL Server 2008R2 Express / Enterprise Evaluation is used in the lab
 - Should also work for SQL Server 2008, SQL Server 2005
- Lab shows
 - How to create a **Linked Server** from SQL Server to your IBM I
 - How to run SELECT, INSERT, UPDATE, DELETE statements on SQL Server that affect the IBM I
 - Create / save / run a **T-SQL batch program**
 - Use the **SQLCMD** program to run T-SQL from a command prompt
 - Use **SQL Server Agent** to run a T-SQL batch
- **Questions:** craig@web400.com