Working with Query Objects

Intellicus Enterprise Reporting and BI Platform

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Acknowledgements

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Query Objects

Query Objects form the business Meta layer for end user reporting. Query Objects hides the physical database details, SQL complexities, table names from the end user who can design ad hoc reports, charts, KPIs and dashboards without knowing where and how the data is fetched from the database.

A query object contains details to fetch desired data from a desired data connection. A Query Object provides data for reports and Cube Objects.

A Query Object can be a source for another Query Object.

Pre-requisites

License
Ensure that Intellicus system you are using is licensed for Ad hoc Reporting feature.

Access Rights
Ensure that currently logged in user has 'Data Administrator' privilege.
Ensure that currently logged in user has access rights granted on the database connections on which Query Object needs to be designed.

Workflow Enabled Query Objects

Query Object Designer

Following are main sections in the cube designer.

1) Editor or design canvas - the central area of the Query Object designer that diagrammatically represents the design of the currently opened Query Object.
2) Step Selector – the left pane from where you can drag required Steps to design the Query Object
3) Properties tab – the bottom area where you can edit properties of any selected item on the editor
4) Results tab - the bottom area where you can view data result set processed up to currently selected step
5) Button palette – Action buttons on the top for CRUD operations
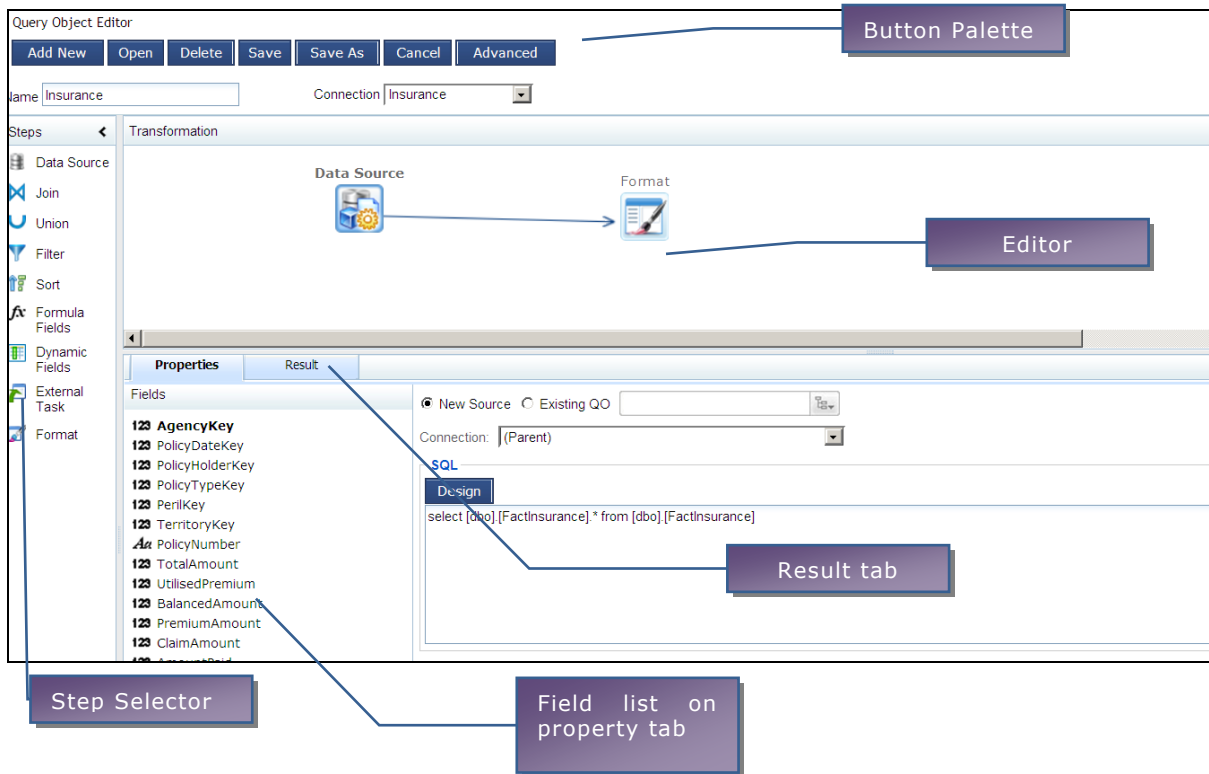
Editor section is a plain canvas. When you add a new Query Object the designer gives you already created two steps – data Source and Format.

An edge line joins the two steps, with an arrow depicting the flow of data.

You can select a new step from the step selector and drag it on the editor and then join the step with another. Draw the joining line in the direction of dataflow.

You can also directly drop a step on an existing edge line, to insert the new step between the two existing ones joined by that line. For example, to insert a filter step between Data Source and Format, drop the Filter step on the line.

You can have multiple Data Source steps in a Query Object.

Based on standard data processing rules, some steps can take multiple inputs. For example, a join step can take two inputs and a Union can take more than two inputs.

At each step you can select the Result tab to see the result data set up to selected step. This is a sample data set and may not be complete data.

Simple Steps

Following are the primary steps with their behaviour and properties explained:

Data Source step

The Data Source step brings data into this Query Object.

We can bring data into this Query Object from
  i) RDBMS source using SQL or stored procedure
  ii) File source
  iii) Web service
  iv) Another Query Object

There can be any number of Data Source steps in a Query Object.

Each Data Source step has following properties to set:

Properties

Property	Values	Comments
New Source/ Existing QO	New Source/ Existing QO	You choose whether a new SQL or file source to be created or you can use an existing Query Object
Connection	Select from available list or Select (Parent)	When selected (Parent), then this Data Source fetches data from the connection specified at Query Object level (at the top, below the button palette), or falls back to default connection configured for the user. When a connection name is selected, then this Data Source fetches data only from that connection, irrespective of Query Object connection or connection of other Data Source in this Query Object.
SQL	A Complete SQL statement designed with the help of SQL Wizard	This property is visible when you select a connection that points to an RDBMS. The SQL Designer window opens for you to design an SQL or procedure. See below for SQL Designer details.
File Source	File name, File type and parsing details designed with help of File Selector Wizard	This property is visible when you select a connection that points to a file system. The File Selector window opens for you to specify File name, File type and parsing details.
Web Service	Web service, method name and Record pattern	This property is visible when you select a connection that points to a Web Service.

	details designed with help of Web Service Selector.	The File Selector window opens for you to specify Web service, port, method name and Record pattern.
Existing QO	Select an existing Query Object	The output of the select Query Object becomes input of this Data Source.
Sorted	Yes/No	You specify this data is already sorted on one or more fields. This flag helps in optimizing sort dependant steps or processes later in the data flow.
Fields	Lists all fields available in this Data Source	

SQL Designer

This wizard allows you to design SQLs by dragging and dropping tables (Design tab) or by typing the complete SQL (Edit tab).
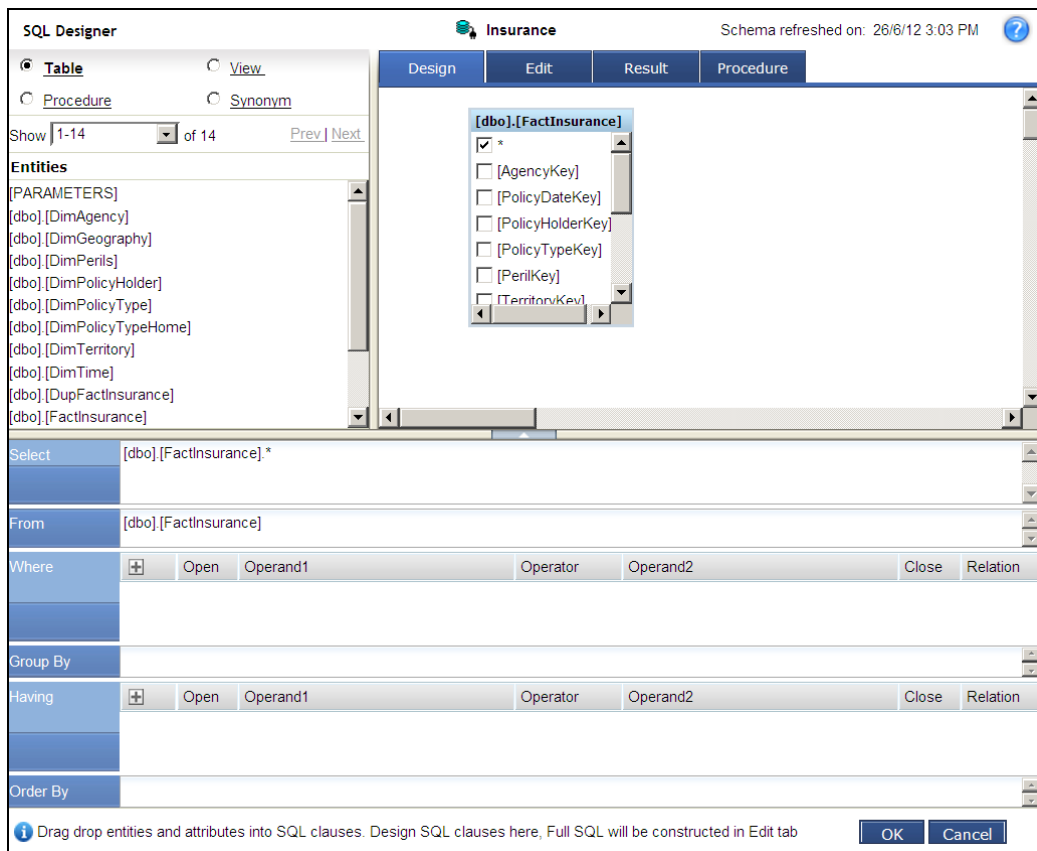
File Selector

This wizard allows you to select a file and provide parsing properties to fetch records from that file.

Web Service Selector

This wizard allows you to select a web service available from the connected web Service provider and also provide Method, Record pattern details.

By reading the WSDL, it also prompts for parameters required to request the Web Service.

Field Level Properties at Data Source step

Property	Values	Comments
Sort Priority	Number 0-N	If the data is sorted on multiple fields then specify sort priority number of this field Primary sort field should be lowest number
Sort Criteria	Ascending/ Descending	
Data Type	CHAR, NUMBER, DATE, BINARY	
Data Format	Format String	Specify the format of the incoming data. This is useful only if Date or IP Address type data are incoming in CHAR fields but needs to be converted to Date and Number types for further use.
Database	Select Time zone	Specify the time zone in which the

TimeZone	from the list	incoming date data is stored. This is useful only if date time data needs to be converted to other time zone data based on reporting requirement. For example when incoming GMT data need to show EDT (or any requested TZ) value in report, specify that the incoming data is GMT. The output format is generally specified in Format step or in user preference.
Locale	Select from the list	
Qualified Name	Type yourself	This name helps using the field name in all the SQL clauses such as WHERE and ORDER BY or to resolve field name ambiguity when same field comes from two tables or expressions.

Format step

Format step primarily lists all fields provided by this Query Object.
Format step generally is the last step, captures captions etc. and acts as business view of the Query Object.

For each field following properties are set:

Property	Values	Comments
Field	Name of Field (read only)	Original name of field. When you change the caption, the caption keeps showing in the field list
Source	Step Name (read only)	In which step did this field originate in this Query Object Helps in tracking a field source in a complex Query Object
Caption	Type yourself	
Hyperlink	Drilldown detail or Hyperlink URL	Detailed steps of specifying hyperlink is mentioned below in a separate section
Group Label	Type Yourself or Select from list	To create a new group, Type the new group name. To put this field into an existing group, select group name from the drop down list
Hidden	Yes/No	Hidden = Yes makes this field invisible to users for reporting process. It also hides this field from next Query Object if this Query Object is used as a Data Source.
Format properties		
Width	Number 1-100	Default width of this field when dragged onto a report.
Output Format	Format String	This field value will be formatted using this format string.

		Useful for Date and Number formatting. If you need to decide the format string at run time, then select "Apply Locale Default" property in the Format String selector dialog.
Align	Left, Right, Center	This field, when put on a report, its values will be aligned to the selected side by default
Input Format	Format String	This format string decides the Prompting format for the value for this field in Ad hoc Filter screen This is useful in prompting date values in desired format. This is also used to input IP Address format for number values
User Time Zone	Select Time zone	Specify the time zone in which the date data is to be converted and displayed. The Report Server calculates the difference between Database Time Zone and User Time Zone, and does time conversion. For deciding User Time Zone at run time, select SYS_USER_TZ value

Filter Step

Filter Step is used to apply pre-defined filters and set Lookup values.

Filter step can take input from any step and provide output to any step in the flow of Query Object.

The properties tab shows two sections for a Filter step.

1) Ad hoc Filters
2) Field properties

Ad hoc Filters

You select available Field name, Criteria and Value to apply ad hoc filters for this step.
Only the data that matches the filters can pass through this step.

Field Properties

For each select field, following properties are set:

Property	Values	Comments
Lookup Values	Yes/No	Whether this field provides a list of lookup values for end user to easily choose values to apply filter
Mandatory	Yes/No	Mandatory = Yes will mandate reports using this Query Object to apply filter on this field
Hide	Yes/No	Hide = Yes will remove this field for filter options. End user will not see this field in filter-on field list A field can either be set as Mandatory or be set as Hide!
Lookup Details		
Key Value Field	Select a field	When we have Lookup values with display and value columns, the value should apply to filter on key field, instead of display applying filter on this field. This is a SQL optimization option. If you create a lookup with customerID and customer name and your table is indexed on customerID, then for the customer name field, set customerID as Key value Field.
Dynamic	Yes/No	Dynamic=Yes. You can set a source (SQL or another Query Object) for the Lookup values
Static	Yes/No	Static=Yes You can type in the lookup values
Restrict to list	Yes/No	Whether the list shown to the end user for selecting the values for filtering should allow typing in new value other than list
Fetch	Now, On Every use, Lazy, By Search	Now = Fetch the values only upon saving of this Query Object. On Every Use= Fetch the values every time end user screen loads for prompting filters Lazy = Fetch the values when user selects this field for filtering and clicks on combo

		for value selection By Search = Fetch matching values when user starts typing values in the filter
Min. Key length	Number 0-4	By search fetching of data starts only after these many characters are typed by the user
User Defined	Yes/No	Yes = You will provide a user defined SQL or data source of lookup values No = Automatically generate DISTINCT based query to get lookup values
New Source/ Existing QO	New Source/ Existing QO	Whether user defined is new SQL or an existing Query Object
Display Column		From lookup value result set, select the field of display
Value Column		From lookup value result set, select the field of values
Link Lookup	Yes/No	Specifies whether this is a nested lookup
Link to Parent Field		Select the parent field to which this field will be nested. For example, Set Country as the parent field for this property of State field Note that you must use the parent value in the where clause of lookup SQL
Link Mandatory	Yes/No	Yes = Before applying a filter on Parent field, the nested field lookup values will not be listed No = Before applying a filter on Parent field, ALL values will be listed for nested field. When a filter is applied on parent field, NESTED values will be listed

Sort Step

Data passing though a Sort step gets sorted based on the properties set in the step.

The properties to set are:

Property	Values	Comments
Sort by Field	Select field from list	You can add multiple such fields using Sort by and Then by lines based priority order of sort need.
Criteria	Ascending/Descending	

Case Insensitive	Yes/No	Yes = ABC is at same level as ABc
		    XYZ is smaller than abc
		No = ABC is smaller than ABc
		    XYZ is bigger than abc

Formula Fields Step

Formula Fields step allows you to add calculated fields that are populated at run time. These calculated fields are generally based on existing fields.

Action Button	Comments
Add	To add a new formula field
Delete	To delete the selected formula field

For each added formula field, following properties are set:

Property	Values	Comments
Name	Type Yourself	Name and caption of the field, as visible in next steps and to the end user
Return Type	Number	Determines the data type of the formula

	Char Date	field
Formula	Formula String	Java script syntax formula

Formula String Syntax

Follow JavaScript Syntax to create a formula. To create a formula, you can use field names and define variables. A formula may have 'if' construct as well as 'nested if' construct. You can use logical operators too. If want to add more than one statements in formula, use semicolon ';' as separator between two statements.

Example:
For a formula field named TotalAmount,

```
var total ;
if (unitprice < 10 )
{total = unitprice*quantity;}
else
{total = unitprice;}
TotalAmount = total;
```

Advanced Steps

Merging two sources

Intellicus Query Objects support two types of merging of data sets.
1) Join – Equijoin, Outer joins
2) Union – Equal columns, Unequal columns

Join

This step takes two inputs. When the data is passing through this step, the data of both inputs will be joined based on properties set for this step.
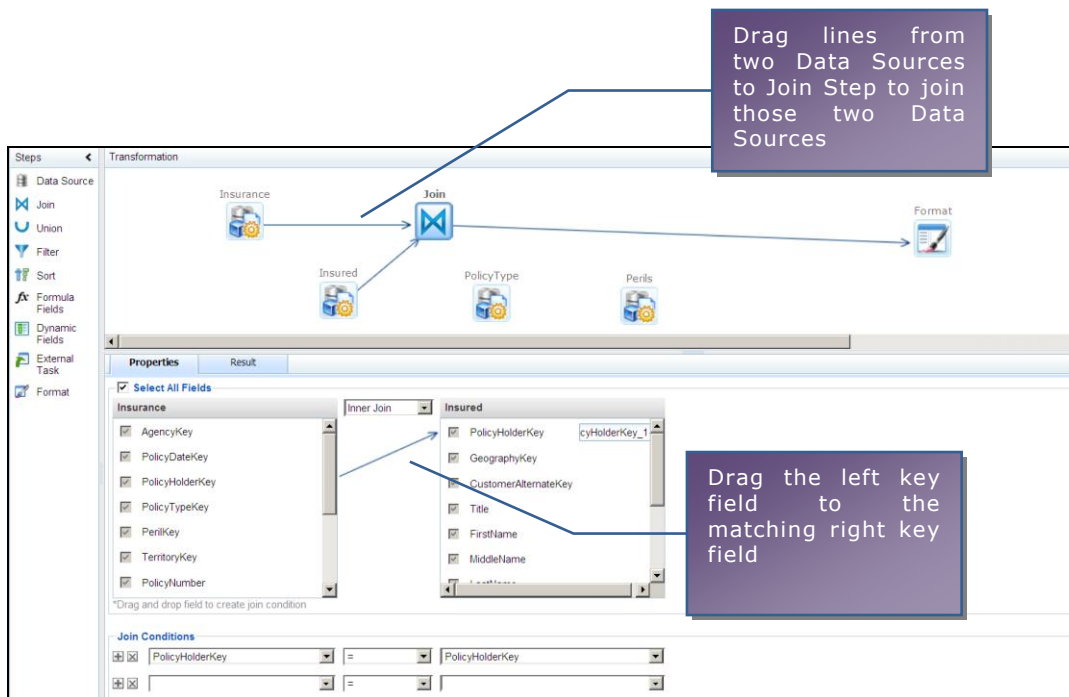
The Join step properties are:

Property	Values	Comments
Select All Fields	Yes/No	Yes = All fields from both the sources will be available in the output of this step The ambiguous field names will be automatically renamed (suffixed with a underscore and number) No = You can choose which fields should be available in the output of this step Choosing is done by selecting the checkbox adjacent to field names of both inputs.
Join Type	Inner Join Left Outer Right Outer Full Outer	
Join Conditions	Field name Operator Field Name	Forms the Join Key

Union

Union step takes two or more inputs. The data passing through this step appends to one another and forms a single output.

Generally the data inputs selected for Union are of same structure i.e. the columns are same. But this step supports exceptions and allows having extra columns in some inputs. You can decide whether to carry forward the fields coming from only some inputs to output.

During the union process you can decide to take the out sorted or you can prefer unsorted appending.
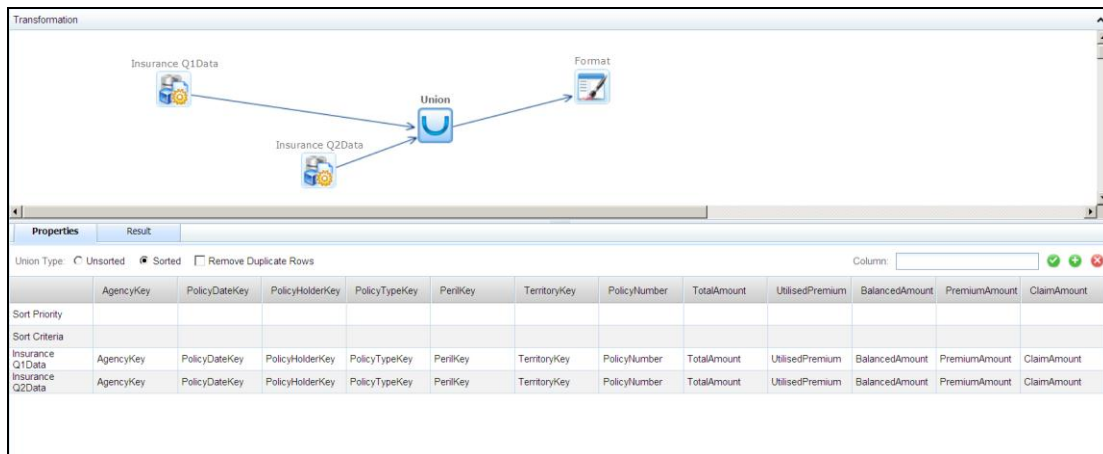
The properties of Union step are:

Property	Values	Comments
Union Type	Unsorted Sorted	The output of this step shall be sorted or not
Sort Priority	Number 1-3	This property is at field level. This is set below the field name. Set the number 1,2 or 3 to the fields which should be sort key.
Sort Criteria	Ascending Descending	
Remove Duplicate Rows	Yes/No	To get distinct rows from Union step
Column	Type Yourself	The selected field name populates automatically. You can change the caption of the resultant field

Action Button	Comments
Add Column	To add a new Column
Rename	To Apply typed name to the selected column

Column	
Delete Column	To delete the selected Column

Query Objects with Dynamic Fields

Dynamic Fields Step

Dynamic Fields step allows you get flexibility of adding or removing fields to a Query Object at run time based on your meta information.

This step has capacity to
1) Add dynamic fields by Pivoting data from input Data Source.
2) Dynamically fetch meta data for field properties

This step takes one input Data Source.

Dynamic Metadata

This step takes an SQL or other Data Source that defines the metadata of the dynamic result set at run time.
This SQL will be fired just before fetching the input Data Source.

The Field Attribute Mapping section takes each field from the metadata result set and maps it to Query Object field properties.
The important mappings are Field ID, Field Name, Caption and Data Type.

Pivoting

Pivoting allows you to convert highly normalized, Name Value paired data into flattened tabular data.

Pivot Columns: specifies which column has field ID and which column has value.

Select Grouping: specifies grouping fields, when grouped on which, the normalized data converts to flat table.

Custom Step

External Task

External task step allows you to call standard and custom 3rd party processes from within Intellicus Query Object. Some may be in-proc and some tasks may be sent to remote execution by appropriate bridge components.

There are few pre-configured external tasks. More external task types can be configured.

Pre-configured external task types:

Task Type	Comments
R Job	R Analytics Server scripts can be executed and result be retrieved
Hive Job	
Pig Job	
Custom Java Map Reduce Job for Hadoop	

Query Object Properties

Connection

Query Object at the top level has two properties:

Property	Values	Comments
Name	Type yourself	
Connection	Select from list	(Default) = Use default connection available at run time based on priority of user selection or server configuration Connection Name = Always run using this named connection, irrespective of user selection.

Access Rights

Access rights on a Query Object can be granted to everyone, selected organizations or select users. Access rights given at Query Object level supersede folder level access rights.

Access rights applicable to Query Object are:

Access Right	Comments
Read	User can see the definition of the Query Object User cannot edit, delete the Query Object. User cannot run reports using this Query Object.
Write	User can delete, edit the Query Object. This right when given at folder level, user can create new Query Object in that folder, provided that user has Data Administrator system privilege.
Execute	User can execute reports using this Query Object. User can create new reports using this Query Object.

Advanced Properties

Advanced properties can be at each Query Object level to control the behaviour of the Query Object and reports generated using this Query Object.

Property	Values	Comments
Audit Log	(Default) Enable Disable	You can switch ON or OFF audit logging for reports generated using this Query Object, irrespective of global audit logging setting.
Run Priority	(Default) Low Medium High	Decides the priority in the request queue of Report Server
Database Connection Timeout		Overrides the same property value at connection or global level
Data Source Fetch Size		Overrides the same property value at connection or global level
Max. Rows		Maximum rows restriction from this Query Object. Report level Max. Rows value can further downsize, but that cannot upsize this value
Query Execution	(Default) Synchronous Asynchronous	Asynchronous = Useful to free rendering thread when database is taking long time to process the data before it starts sending data in. Example: Heavy sorting at database, Complex procedures processing data

		before sending data Synchronous = thread waits after sending database request till data returns
Restrict To Background	(None) Enable Disable	Enable = Reports using this Query Object shall be allowed by submitting to Run in back ground only. Useful for long time taking Query Objects. Disable = Both Run and Run in background options will be available. This facility is dependent on scheduler licensing
Restrict To Formats	(None) List of available formats	(None) = reports using this Query Object can run in all supported formats. Selected Values = Reports using this Query Object will be allowed to run only mentioned formats. For example a report with few million rows in the output may be ok only in XLS and Raw text formats.
Default Memory Usage Per Exec		Overrides the same property value at connection or global level
Report Server Chunk Timeout		Overrides the same property value at connection or global level
Sort Area Size Per Exec		Decides memory limitations set for in-memory sorting of rows. Overrides the same property value at connection or global level
Sort Threads Per Exec		Decides memory limitations set for in-memory sorting of rows. Overrides the same property value at connection or global level

Upgrading from Intellicus 4 or 5

If you are upgrading from Intellicus 4 or 5, then you will observe the following changes:

Changes

- The Query Object Editor has completely changed into a graphical editor
- The New Query Object is based on Multiple Steps concept
- The Query level properties and Field level properties have been categorized and moved into separate steps or sections

Backward Compatibility

All of your Query Objects created in previous versions of Intellicus are automatically upgraded to the new structure. All reports based on those Query Objects will run properly without doing any manual changes to the Query Object.

When you open the Query Object created in previous versions of Intellicus, then it opens properly in the new designer.

You may have to slightly learn the new graphical user interface, SQL Wizard, the property values are slightly placed differently than older version.

Mapping the Properties

Item		Previous Version	New Version
SQL		Edit button on Query Object Editor screen	Select Data Source step -> SQL Design Button on properties tab
Field properties			
	Formatting	Select field on Query Object Editor Screen, property appears next to the field on right side	Select Format step -> Select field name in the properties tab
	Field Source properties	Select field on Query Object Editor Screen, property appears next to the field on right side	Select Data Source step -> Select field name in the properties tab
	Field Lookup Values property	Select field on Query Object Editor Screen, property appears next to the field on right side	Select Filter Step -> Select field name in properties tab, Select Lookup Values check box
	Mandatory Filters	Filters section on right top section of Query Object Editor	Select Filter Step -> Select field name in properties tab, Select Mandatory Checkbox

Miscellaneous

Hyperlink

When you make a field a clickable hyperlink, you can link a URL or a report with that report. You can make "drill-down" reports using hyperlinked field.
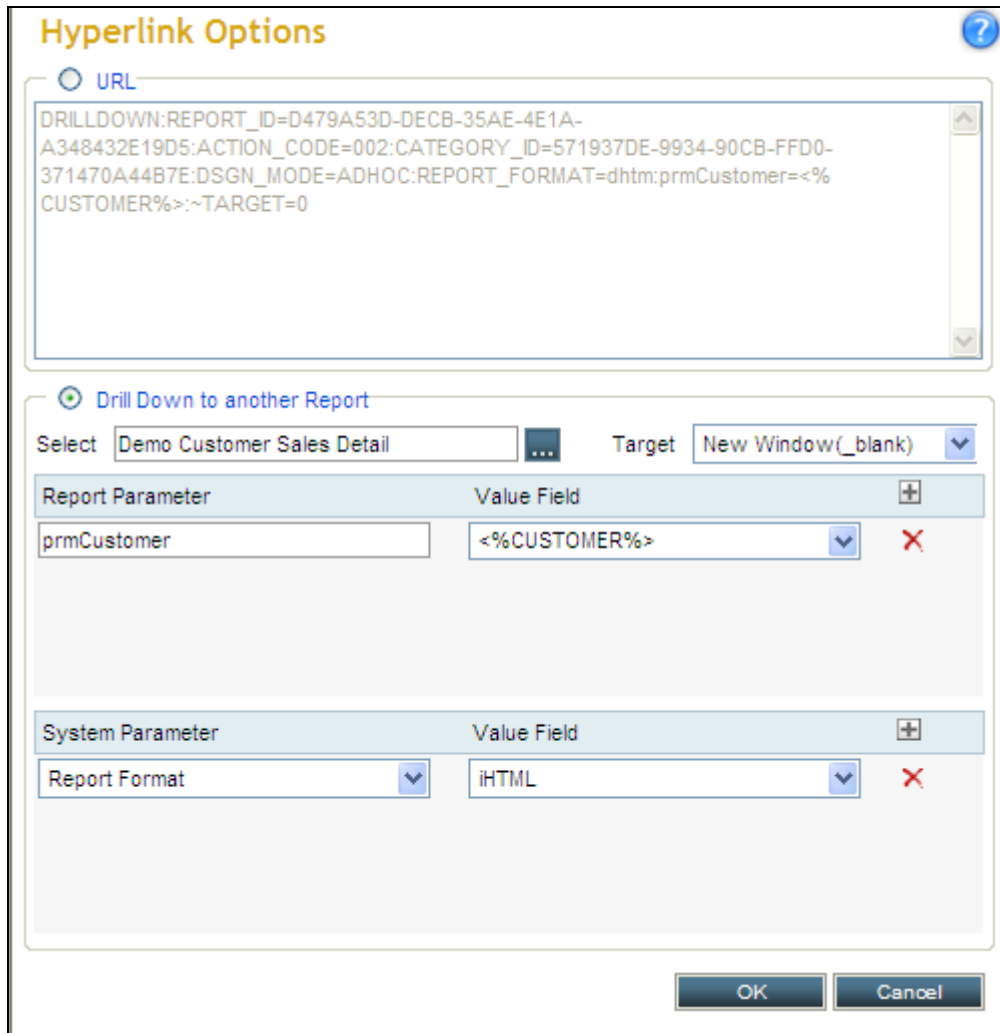

Figure 1: Hyperlink Options dialog box

Hyperlink dialog properties

URL
The URL is automatically constructed by the "Drill Down to another Report" settings.

You can over write the URL on your own.

For external links such as web links you have to write your own URL text.

Drill Down to another Report

Property	Values	Comments
Select Report	Select Report using Report Selector	Report to drill down to
Target	New Window Same Frame Parent Frame Parent Window	As per HTML standards
Report Parameter	Parameter of the child report	
Report parameter Value Field	Select field from this report	Select the field whose value to be passed to child report as the selected parameter
System Parameter	Select from list	Select if you need to pass system parameter value from this report or exclusively
System parameter Value Field	Select value	For each system parameter you choose to pass, relevant values for that system parameter populates in the list automatically. You shall choose desired value.