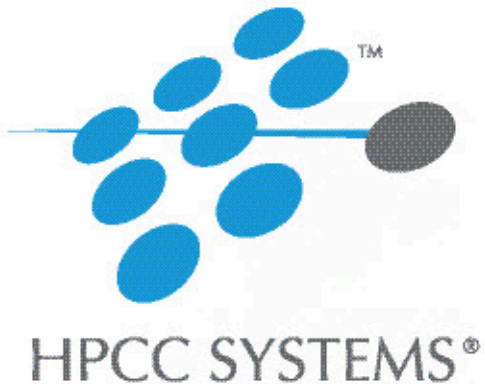
WsSQL ESP Web Service Guide

Boca Raton Documentation Team



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Introduction

The WsSQL Web service is an add-on service that provides an SQL interface into HPCC Systems®. The Web service accepts a subset of prepared and standard SQL queries. This provides access to most HPCC Systems data and published queries over HTTP or HTTPS using SOAP or REST interfaces.

The WsSQL service maps HPCC Systems logical files to RDBMS tables. HPCC Systems Published Queries are exposed as RDBMS Stored Procedures.

The WsSQL service also provides convenient methods to obtain system information, metadata, and results from previously run queries.

This service is intended to be used in a programmatic fashion (for example, via database drivers), but can also be used in an interactive fashion by users who are more comfortable using SQL than ECL. This makes it possible to submit ad-hoc queries without learning ECL.

The service exposes HPCC Systems logical files as RDB tables.

- HPCC Systems Logical File <-> RDB Table
- HPCC Systems Record Fields <-> RDB Table Columns
- HPCC Systems Published query <-> RDB Stored Procedure
- Provides HPCC Systems with system and data RDB metadata
- Supports subset of SQL syntax
- Non-transactional
- Provides means for utilizing HPCC Systems index files for faster reads.

Supported File Types

The WsSQL service supports all HPCC Systems file types except :

- XML
- Files with Nested Child Datasets
- Files without record layout in its metadata.

  The WsSQL service **only supports files which contain the record definition in the logical file's metadata.** Sprayed files do not contain this metadata. This metadata exists on any file or index which is written to the HPCC Systems Distributed File System (DFS). Sprayed data files typically undergo some processing and an OUTPUT of the transformed data to disk before use, so this should not interfere with the service's usefulness. You can use the *CreateTableAndLoad* method to produce a usable file from a sprayed file or one on a landing zone. See CreateTableAndLoad for details.

Setup

The WsSQL service is included in the HPCC Systems platform.

> Prior to version 7.0, WsSQL was an add-on product and was installed separately. If you have a system configured with WsSQL prior to version 7.0, you should uninstall WsSQL before upgrading the platform.

Configuration

We recommend taking the time to read this manual in its entirety; however, the following is a quick start summary of steps.

Configure Using Wizard

1. Once Configuration Manager is running:
2. Create a new environment using the wizard.

   The WsSQL service is automatically added and its service binding is created in the ESP Server's configuration.
3. Save the environment file.
4. Copy your environment.xml file to all servers.

```
# for example
sudo -u hpcc cp /etc/HPCCSystems/source/NewEnvironment.xml /etc/HPCCSystems/environment.xml
```

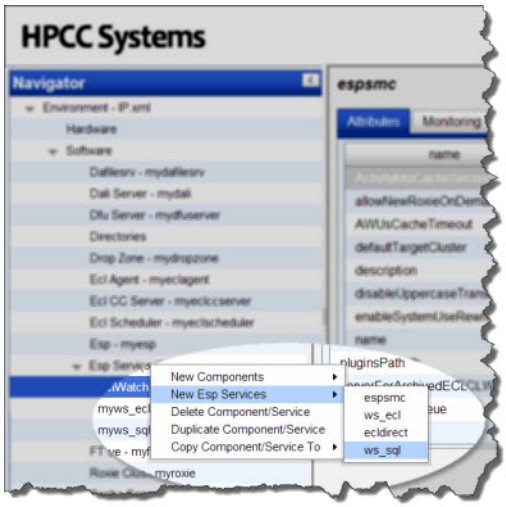
5. Exit Configuration manager.
6. Restart the system.
7. Access the WsSQL interface in your browser (port 8510).
8. Run the Echo method to confirm connectivity. See [Echo].

Configure Manually

This method is useful when adding the WsSQL service to an existing system that did not have a service configured or to add an additional WsSql service.

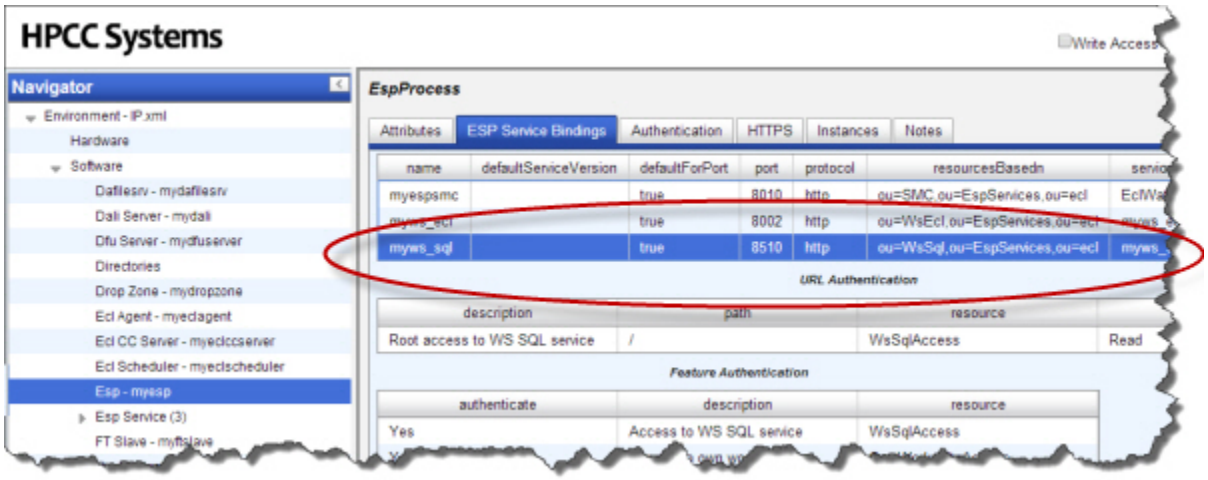
1. Once Configuration Manager is running:
2. Open an environment file (*.xml) in Advanced Mode.

   If you are adding WsSQL to an existing system, open an environment file that matches the live environment.xml. It is highlighted.
3. Check the Write Access box.
4. Right-click on the **Software** portion of the tree in the left panel, and select **New ESP Service** > **ws_sql** .



This adds a definition for the service.

5. Select the **ESP** component, then select the ESP Service Bindings tab.



6. Provide the name of the service to bind and the port. (Default port is 8510)

7. Save the environment file.

8. Copy your environment.xml file to all servers

```
# for example
sudo -u hpcc cp /etc/HPCCSystems/source/NewEnvironment.xml /etc/HPCCSystems/environment.xml
```

9. Exit Configuration manager.

10. Restart the system.

11. Access the WsSQL interface in your browser:

    Using *http://nnn.nnn.nnn.nnn:pppp* (where nnn.nnn.nnn.nnn is your ESP Server's IP Address and pppp is the WsSQL service port. The default port is 8510)

12.Run the Echo method to confirm connectivity. See [Echo].

Using HPCC Systems Files as a data source

Once installed and configured, the WsSQL service will process submitted SQL statements and generate dynamic ECL code. The code is submitted to and executed by your HPCC Systems platform. The result set is returned to your application.

Note: The WsSQL service **only supports files which contain the record definition in the logical file's metadata.** Sprayed files do not contain this metadata. This metadata exists on any file or index which is written to the HPCC Systems Distributed File System (DFS). Sprayed data files typically undergo some processing and an OUTPUT of the transformed data to disk before use, so this should not interfere with the service's usefulness. You can use the *CreateTableAndLoad* method to produce a usable file from a sprayed file or one on a landing zone. See CreateTableAndLoad for details.

In addition, you can utilize indexes on the HPCC Systems in one of two ways:

1. Provide SQL hints to tell service to use a specific index for your query.

   For example:

   ```
   USEINDEX(TutorialPersonByZipIndex)
   ```

2. Specify the related indexes in the HPCC Systems logical file description.

Index Annotations

The WsSQL service attempts to perform index based reads whenever possible. However, in order to take advantage of index reads, the target HPCC Systems files need to be annotated with the pertinent index file names. This is accomplished by adding the following key/value entry on the file's description using ECL Watch.

From a logical file's details page, enter the information in the Description entry box, then press the **Save Description** button.

This information is used by the service to decide if an index fetch is possible for a query on the base file.

On source file:

XDBC:RelIndexes= [*fullLogicalFilename1*; fullLogicalFilename2]

Example:

```
XDBC:RelIndexes=[tutorial::yn::peoplebyzipindex;
                tutorial::yn::peoplebyzipindex2;
                tutorial::yn::peoplebyzipindex3]
```

In this example, the source file has three indexes available.

You can add annotations using the SetRelatedIndexes method.

On the index file:

XDBC:PosField=[*indexPositionFieldName***]**

Example:

```
XDBC:PosField=[fpos]
```

The FilePosition field (fpos) can have any name, so it must be specified in the metadata so the service knows which field is the fileposition.

Simply enter the information in the description entry box, then press the **Save Description** button.

Note: You should enter this information BEFORE publishing any query using the data file or indexes. Published queries lock the file and would prevent editing the metadata.

Methods

These methods are included in the WsSQL service interface:

- **Echo**

  This method is provided to test end-to-end communication. The Input string is echoed in response.

- **GetDBSystemInfo**

  You can use this method to gather version information from the HPCC Systems platform.

- **GetMetadata**

  This method provides metadata you can use to create a view or model of the target HPCC Systems platform as a SQL accessible DB. You can request Tables, Stored Procedures, and/or Targetclusters.

- **ExecuteSQL**

  Use this method to submit standard (non-prepared) SQL queries. This method accepts free-hand SQL text (see supported grammar below).

- **GetRelatedIndexes**

  This method retrieves information from a logical file's description about related indexes.

- **GetResults**

  This method provides results from previously executed queries.

- **PrepareSQL**

  This method provides the ability to submit a free-hand SQL request for later use as a parameterized query. It compiles the query and returns the Workunit ID (WUID). This WUID is later used to execute the query with provided input parameters using the ExecutePreparedSQL method. This is ideal for queries which are executed many times with different values.

- **ExecutePreparedSQL**

  This method executes a previously created parameterized SQL query. The query is referenced using a Workunit ID (WUID), which is returned from the PrepareSQL method. The caller can specify sequence of input parameters as key-value pairs, which are bound to the precompiled query.

- **CreateTableAndLoad**

  This method reads a logical file or a file on a landing zone and creates a new table and loads the data from the source file creating a table (logical file) that WsSQL can use. This function is intended to use when you have a logical file without metadata or to import a new file into an HPCC Systems platform.

- **SetRelatedIndexes**

  This method adds information to a logical file's description that WsSQL uses as an annotation of a related index.

Echo

This function takes an input string and "echoes" the value in its result.

This function is intended for end-to-end connectivity testing. A successful response indicates a good connection to the server hosting the Ws-SQL Web service. This function is designed for connectivity testing.

We recommend using this function as a first step of the application development process.

Sample Input XML

```
<soap:Envelope>
 <soap:Body>
  <EchoRequest>
   <Request>StringToEcho</Request>
  </EchoRequest>
 </soap:Body>
</soap:Envelope>
```

Request Tag Descriptions

Tag Name	Req?	Description
EchoRequest	N	Structure containing the request
Request	N	String to echo in result

Response Tag Descriptions

Tag Name	Description
EchoResponse	Structure containing response
Response	Response

GetDBSystemInfo

This method allows you to get HPCC System version information.

Sample Input XML

```
<soap:Envelope>
 <soap:Body>
  <GetDBSystemInfoRequest>
   <IncludeAll>1</IncludeAll>
  </GetDBSystemInfoRequest>
 </soap:Body>
</soap:Envelope>
```

Request Tag Descriptions

Tag Name	Req?	Description
GetDBSystemInfoRequest	Y	Structure containing the request
IncludeAll	N	If set to 1 or true, all available information is returned

Response Tag Descriptions

Tag Name	Description
GetDBSystemInfoResponse	Structure containing response
Exceptions	Structure containing exceptions. See Exceptions Structure in Common Structures
Name	Name.
FullVersion	Full Version of the HPCC Systems platform
Major	Major version of the HPCC Systems platform
Minor	Minor version of the HPCC Systems platform
Point	Point of HPCC Systems platform
Project	Project of HPCC Systems platform
Maturity	Maturity of HPCC Systems platform
WsSQLFullVersion	Full Version of WsSQL
WsSQLMajor	Major of WsSQL
WsSQLMinor	Minor of WsSQL
WsSQLPoint	Point of WsSQL
WsSQLProject	Project of WsSQL
WsSQLMaturity	Maturity of WsSQL

GetDBMetaData

This methods allows you to query the HPCC Systems platform and get metadata to use to create a view or model of the target HPCC Systems as a SQL accessible DB.

You can request one or more of the followinfg:

- Tables (Logical files in the HPCC Systems Cluster)
- Stored Procedures (Published Queries)
- TargetClusters

Sample Input XML

```
<soap:Envelope>
 <soap:Body>
  <GetDBMetaDataRequest>
   <IncludeTables>1</IncludeTables>
   <TableFilter/>
   <IncludeStoredProcedures>1</IncludeStoredProcedures>
   <QuerySet/>
   <IncludeTargetClusters>1</IncludeTargetClusters>
   <ClusterType/>
  </GetDBMetaDataRequest>
 </soap:Body>
</soap:Envelope>
```

Request Tag Descriptions

Tag Name	Req?	Description
GetDBMetaDataRequest	Y	Structure containing the request
IncludeTables	N	If set to 1 or true, available tables are included in response
TableFilter	N	Filter for table results
IncludeStoredProcedures	N	If set to 1 or true, available Stored Procedures are included in response
QuerySet	N	QuerySet to use as filter for Stored procedures to return
IncludeTargetClusters	N	If set to 1 or true, available Target Clusters are included in response
ClusterType	N	Cluster type to use as filter

Response Tag Descriptions

Tag Name	Description
GetDBMetaDataResponse	Structure containing response
Exceptions	Structure containing exceptions. See Exceptions Structure in Common Structures
TableCount	Count of available tables
Tables	Structure containing one or more tables
Table	Structure containing one table
Name	Table name
Columns	Structure containing one or more columns
Column	Column
Name	Column name
Type	Column data type (e.g., unsigned8, string3)
ECL	ECL Definition for the table
Format	Table format (e.g., FLAT, KEYED, etc)
ContentType	Content Type
Description	Description
IsKeyed	Boolean indicator: Is this an index?
IsSuper	Boolean indicator: Is this a superfile?
CsvQuote	Quote character (only valid for CSV files)
CsvSeparate	Separator character (only valid for CSV files)
CsvTerminate	Record terminator character (only valid for CSV files)
Group	Group
MaxRecordSize	Maximum record size
Modified	Date modified
NumParts	Number of file parts
Owner	Owner name
QuerySets	Structure containing one or more Query Sets
QuerySet	Structure containing one Query Set
Name	Query Name
QuerySetQueries	Structure containing one or more QuerySetQueries
QuerySetQuery	Structure containing one QuerySetQuery
Name	Query Name
Id	Query ID (for internal use and informational purposes only)
Wuid	Workunit ID
Suspended	Boolean indicator: Is the query suspended?
Signature	Query Signature
InParams	Structure containing one or more Input parameters

InParam	Structure containing one Input parameter
Name	Parameter name
Type	Parameter data type (e.g., string)
ResultSets	Structure containing one or more Result Sets (Only the first result set is returned from a WsSQL service request)
ResultSet	Structure containing one Result Set
Name	Result set name
OutParams	Structure containing one or more output parameters
OutParam	Structure containing one output parameter
Name	Parameter name
Type	Parameter data type (e.g., string)
QuerySetAliases	Structure containing one or more QuerySetAliases
QuerySetAlias	Structure containing one QuerySetAlias
Name	Query name
Id	Query Id
ClusterNames	Structure containing one or more TargetClusters
ClusterName	Structure containing one TargetCluster

ExecuteSQL

Use this method to submit standard (non-prepared) SQL queries. The **SqlText** input tag accepts free hand SQL text (see Supported SQL grammar below).

If you are executing SQL using a SELECT or SELECT JOIN, you must specify the **TargetCluster**.

If you are executing SQL that uses a CALL to a stored procedure, you must either fully qualify the procedure name (For example: Roxie.FindPeopleByZip) or specify the **TargetQuerySet** here. Parameters must be passed in order, not by name. You can retrieve the order using GetDBMetaData.

To exclude the result schema in the result, set the **SuppressXmlSchema** option to 1 or true.

For result set paging, you can limit the total query results and the initial page returned (**ResultWindowStart**, **ResultWindowCount**).

Sample Input XML

```
<soap:Envelope>
  <ExecuteSQLRequest>
    <SqlText>SELECT * from tutorial::yn::tutorialperson where lastname='JONES'</SqlText>
    <UserName>Emily</UserName>
<!-- Use either TargetCluster or TargetQuerySet, not both -->
<!-- If stored procedure was fully qualified, you can omit TargetQuerySet -->
    <TargetCluster>thor</TargetCluster>
    <TargetQuerySet></TargetQuerySet>
    <SuppressResults>1</SuppressResults>
    <SuppressXmlSchema>0</SuppressXmlSchema>
    <resultLimit>100</resultLimit>
<!-- For page loading -->
   <ResultWindowStart>0</ResultWindowStart>
   <ResultWindowCount>50</ResultWindowCount>
 </ExecuteSQLRequest>
</soap:Envelope>
```

Request Tag Descriptions

Tag Name	Req?	Description
ExecuteSQLRequest	Y	Structure containing the request
SqlText	Y	Free-hand SQL text (see Supported SQL grammar below)
UserName	N	User Name to pass to HPCC Systems. This is used as the job owner name in HPCC Systems
TargetCluster	Y *	If you are executing prepared SQL using a SELECT or SELECT JOIN, you must specify the TargetCluster.
TargetQuerySet	Y *	If you are executing prepared SQL that uses a CALL to a stored procedure, you must either fully qualify the procedure name in the prepared SQL (For example: Roxie.FindPeopleByZip) or specify the TargetCluster here.
SuppressResults	N	If set to 1 or true, query results are not included in response
SuppressXmlSchema	N	If set to 1 or true, the query result schema is not included in response
Wait	N	Timeout value in milliseconds. Use -1 for no timeout
resultLimit	N	If set, the results can contain as many records as this limit
ResultWindowStart	N	For use with page-loading, the starting record to return
ResultWindowCount	N	For use with page-loading, the number of records to include from the ResultWindowStart

** One or the other is required*

Response Tag Descriptions

Tag Name	Description
ExecuteSQLResponse	Structure containing response
Exceptions	Structure containing exceptions. See Exceptions Structure in Common Structures
ParentWuId	The Workunit Id for the parent workunit (the one with the prepared SQL)
Result	The query result
Workunit	Structure containing Workunit details. See Workunit Structure in Common Structures
resultLimit	The submitted resultLimit
ResultWindowStart	The submitted ReslutWindowStart
ResultWindowCount	The submitted ResultWindowCount

GetResults

This method allows you to get results from previously executed queries. Use the **Wuid** returned from **ExecuteSQL** or **PrepareSQL**. This method is ideal for results paging.

Sample Input XML

```
<soap:Envelope>
 <soap:Body>
  <GetResultsRequest>
   <WuId>W20140529-161930</WuId>
   <SuppressXmlSchema>1</SuppressXmlSchema>
   <ResultWindowStart>0</ResultWindowStart>
   <ResultWindowCount>0</ResultWindowCount>
  </GetResultsRequest>
 </soap:Body>
</soap:Envelope>
```

Request Tag Descriptions

Tag Name	Req?	Description
GetResultsRequest	Y	Structure containing the request
WuId	Y	Workunit Id (WUID)
SuppressXmlSchema	N	If set to 1 or true, the query result schema is not included in response
ResultWindowStart	N	For use with page-loading, the starting record to return
ResultWindowCount	N	For use with page-loading, the number of records to include from the ResultWindowStart

Response Tag Descriptions

Tag Name	Description
GetResultsResponse	Structure containing response
Exceptions	Structure containing exceptions. See Exceptions Structure in Common Structures
Result	The query result
ResultWindowStart	The submitted starting record
ResultWindowCount	The submitted record count
Workunit	Structure containing Workunit details. See Workunit Structure in Common Structures

PrepareSQL

Use this method to submit a free-hand SQL request for later use as a parameterized query. This compiles the query and returns the **Wuid**. This **Wuid** is later used to execute the query with provided input parameters using the **ExecutePreparedSQL** method.

This is ideal for queries which are executed many times with different values.

The prepared SQL can contain any supported SQL grammar.

If you are executing SQL using a SELECT or SELECT JOIN, you must specify the **TargetCluster**.

If you using a CALL to a stored procedure, you must either fully qualify the procedure name in the SQL (For example: Roxie.FindPeopleByZip) or specify the **TargetQuerySet** here. Parameters must be passed in order, not by name. You can retrieve the order using GetDBMetaData.

Create parameters using a ? as a placeholder.

Example:

```
select * from tutorial::yn::tutorialperson where lastname=?
```

Later you would submit a request to **ExecutePreparedSQL** providing a value to use for *lastname* as shown in the following example:

```
<soap:Envelope >
 <soap:Body>
  <ExecutePreparedSQLRequest>
   <WuId>W20140724-135811</WuId>
   <TargetCluster>thor</TargetCluster>
   <SuppressResults>0</SuppressResults>
   <SuppressXmlSchema>1</SuppressXmlSchema>
   <resultLimit>100</resultLimit>
   <Variables>
    <NamedValue>
     <Name>lastname</Name>
     <Value>JONES</Value>
    </NamedValue>
   </Variables>
  </ExecutePreparedSQLRequest>
 </soap:Body>
</soap:Envelope>
```

Sample Input XML

```
<soap:Envelope >
 <soap:Body>
  <PrepareSQLRequest>
   <SqlText>select * from tutorial::yn::tutorialperson where lastname=?</SqlText>
<!-- Use either TargetCluster or TargetQuerySet, not both -->
<!-- If stored procedure is fully qualified, you can omit TargetQuerySet -->
   <TargetCluster>thor</TargetCluster>
   </PrepareSQLRequest>
 </soap:Body>
</soap:Envelope>
```

Request Tag Descriptions

Tag Name	Req?	Description
PrepareSQLRequest	N	Structure containing request
SqlText	Y	Free-hand SQL text (see Supported SQL grammar below)
TargetCluster	Y *	If you are executing prepared SQL using a SELECT or SELECT JOIN, you must specify the TargetCluster
TargetQuerySet	Y *	If you are executing prepared SQL that uses a CALL to a stored procedure, you must either fully qualify the procedure name in the prepared SQL (For example: Roxie.FindPeopleByZip) or specify the TargetCluster here
Wait	N	Timeout value in milliseconds. Use -1 for no timeout

** One or the other is required*

Response Tag Descriptions

Tag Name	Description
PrepareSQLResponse	Structure containing response
Exceptions	Structure containing exceptions. See Exceptions Structure in Common Structures
Workunit	Structure containing Workunit details. See Workunit Structure in Common Structures
Result	Structure containing result (if any)

ExecutePreparedSQL

This method executes a previously created parameterized SQL query.

The target compiled query is referenced using a Workunit ID (**Wuid**), which is returned from the **PrepareSQL** method. The caller can specify sequence of input parameters as key-value pairs, which are bound to the precompiled query.

The prepared SQL can contain any supported SQL grammar.

If you are executing prepared SQL using a SELECT or SELECT JOIN, you can supply a **TargetCluster** to override the one specified when you submitted the PrepareSQL request; however, it must be a cluster of the same type.

If you want to limit the number of results, you must use a LIMIT clause in you SQL query.

For result set paging, you can limit the total query results and the initial page returned (**ResultWindowStart**, **ResultWindowCount**).

Sample Input XML

```
<soap:Envelope>
 <soap:Body>
  <ExecutePreparedSQLRequest>
   <WuId>W20140529-161930</WuId>
   <UserName>EmilyKate</UserName>
<!-- You can override the TargetCluster used in original PrepareSQL query, -->
<!-- but it must be of the same type -->
   <TargetCluster>Thor</TargetCluster>
   <SuppressResults>0</SuppressResults>
   <SuppressXmlSchema>1</SuppressXmlSchema>
   <Wait>-1</Wait>
<!-- For page loading -->
   <ResultWindowStart>0</ResultWindowStart>
   <ResultWindowCount>50</ResultWindowCount>
<!-- Paramaters using name/value pairs -->
 <Variables>
    <NamedValue>
     <Name>firstname</Name>
     <Value>Jim</Value>
    </NamedValue>
    <NamedValue>
     <Name>lastname</Name>
     <Value>JONES</Value>
    </NamedValue>
   </Variables>
  </ExecutePreparedSQLRequest>
 </soap:Body>
</soap:Envelope>
```

Request Tag Descriptions

Tag Name	Req?	Description
ExecutePreparedSQLRequest	N	Structure containing the request
WuId	Y	The Workunit ID (WUID)
UserName	N	The username to use as the job's ownername in the HPCC Systems platform
TargetCluster	Y	If you are executing prepared SQL using a SELECT or SELECT JOIN, you can specify the TargetCluster, but it must be the same type as the one on which it was prepared
SuppressResults	N	If set to 1 or true, query results are not included in response
SuppressXmlSchema	N	If set to 1 or true, the query result schema is not included in response
Wait	N	Timeout value in milliseconds. Use -1 for no timeout.
ResultWindowStart	N	For use with page-loading, the starting record to return
ResultWindowCount	N	For use with page-loading, the number of records to include from the ResultWindowStart
Variables	N	If your prepared SQL has parameters, supply them as name/value pairs inside this structure
NamedValue	N	A structure containing one Name/Value pair
Name	N	Name
Value	N	Value

Response Tag Descriptions

Tag Name	Description
ExecutePreparedSQLResponse	Structure containing response
Exceptions	Structure containing exceptions. See Exceptions Structure in Common Structures
ParentWuId	The Workunit ID for the parent workunit (the one with the prepared SQL)
Result	The query result
ResultWindowStart	The submitted starting record
ResultWindowCount	The submitted record count
Workunit	Structure containing Workunit details. See Workunit Structure in Common Structures

CreateTableAndLoad

This method creates a table (HPCC Systems logical file) which can subsequently be accessed using WsSQL. The table is assigned the layout as specified in the request ECLFields section. The table is then populated with data from an existing file. The source data file can either reside on the HPCC Systems Landing Zone after being uploaded, or it can already have been sprayed on to the system.

Sample Input XML

```
<CreateTableAndLoadRequest>
  <TableName>JIM::MyNewTable</TableName>
  <TableDescription>My Description of the new table</TableDescription>
  <Overwrite>1</Overwrite>
  <EclFields>
    <EclField>
      <FieldName>PersonName</FieldName>
      <EclFieldType>
<!-- Valid types are: BOOLEAN, INTEGER, UNSIGNED, REAL, DECIMAL, STRING, -->
<!--                  QSTRING, UNICODE, DATA, VARSTRING, or VARUNICODE  -->
        <Type>STRING</Type>
        <Locale></Locale>
        <Length>20</Length>
        <Precision></Precision>
      </EclFieldType>
    </EclField>
    <EclField>
      <FieldName>PersonID</FieldName>
      <EclFieldType>
        <Type>INTEGER</Type>
        <Locale></Locale>
        <Length>2</Length>
        <Precision></Precision>
      </EclFieldType>
    </EclField>
  </EclFields>
  <TargetCluster>thor</TargetCluster>
  <Owner>Jimmy</Owner>
  <DataSource>
<!-- Use either SprayedFileName -->
    <SprayedFileName>Tutorial::JD::OriginalPerson</SprayedFileName>
<!-- or full Landing Zone details, not both -->
    <LandingZoneIP>127.0.0.1</LandingZoneIP>
    <LandingZonePath>/var/lib/HPCCSystems/mydropzone</LandingZonePath>
    <LandingZoneFileName>OriginalPerson</LandingZoneFileName>
  </DataSource>
  <DataSourceType>
<!-- Valid types are: FLAT, CSV, JSON, or XML -->
    <Type>FLAT</Type>
    <Params>
      <Param>
        <Name></Name>
        <Values>
          <Value></Value>
          <Value></Value>
        </Values>
      </Param>
    </Params>
  </DataSourceType>
  <Wait>-1</Wait>
</CreateTableAndLoadRequest>
```

Request Tag Descriptions

Tag Name	Req?	Description
TableName	Y	The name of the table to create in the HPCC Systems platform's distributed file system.
TableDescription	N	Your description of the file.
Overwrite	N	Boolean indicator to specify whether to allow the new file to overwrite an existing file of the same name.
EclFields	Y	Structure containing details for the file's record layout. This must match layout of the source data file
EclField	Y	Structure containing details for one field
FieldName	Y	Field Name
EclFieldType	Y	Structure containing Data Type details
Type	Y	Field type. Valid types are: BOOLEAN, INTEGER, UNSIGNED, REAL, DECIMAL, STRING, QSTRING, UNICODE, DATA, VARSTRING, or VARUNICODE
Locale	N	Locale
Length	Y*	Field length
Precision	N	Field precision (decimal places)
TargetCluster	Y	The Target cluster where the job will run.
Owner	N	Owner name for the file
DataSource	Y	Structure containing Data Source details. Either SprayedFileName or LandingZone File details must be provided, not both.
SprayedFileName	Y**	Logical filename of sprayed data file
LandingZoneIP	Y**	IP address or hostname of the HPCC Systems Landing Zone
LandingZonePath	Y**	Path to the datafile on the Landing Zone
LandingZoneFileName	Y**	Physical filename
DataSourceType	N	Structure containing DataSource Type details.
Type	Y	Valid types are: FLAT, CSV, JSON, or XML
Params	N	Structure containing one or more type parameters that describe the DataSource. For example, CSV Terminator = \n
Param	N	Structure containing one type parameter.
Name	N	Name
Values	N	Structure containing one or more values.
Value	N	Value
Wait	N	Timeout value in milliseconds. Use -1 for no timeout

* **Field length is only required for fixed width fields (FLAT files)**

** **Either SprayedFileName or LandingZone File details must be provided, not both**

Response Tag Descriptions

The response structure contains many tags which provide useful information for development and debugging of ECL code. Most of them are outside of the scope of this document. Only those that are useful when using the WsSQL service are listed below.

Tag Name	Description
`CreateTableAndLoadResponse`	Structure containing response
`TableName`	Name of the created table
`Success`	Boolean indicator of success [1 = success]
`EclRecordDefinition`	Supplied record definition in ECL format
`Workunit`	Structure containing Workunit details. See Workunit Structure in Common Structures

SetRelatedIndexes

This function adds a description to a logical file to be used as an annotation indicating an index file which is related to a data file. This makes it available to WsSQL for use in an indexed fetch.

Sample Input XML

```
<SetRelatedIndexesRequest>
  <RelatedIndexSets>
    <RelatedIndexSet>
      <FileName>Tutorial::JD::TutorialPerson</FileName>
      <Indexes>
        <Index>Tutorial::JD::TutorialPersonByName</Index>
        <Index>Tutorial::JD::TutorialPersonByZIP</Index>
      </Indexes>
    </RelatedIndexSet>
  <RelatedIndexSet>
</SetRelatedIndexesRequest>
```

Request Tag Descriptions

Tag Name	Req?	Description
SetRelatedIndexesRequest		Structure containing request
RelatedIndexSets	Y	Structure containing one or more related index sets
RelatedIndexSet	Y	Structure containing one related index set
FileName	Y	Logical filename to which the annotation is added
Indexes	Y	Structure containing one or more indexes to add to annotation
Index	Y	Index to add to annotation

Response Tag Descriptions

Tag Name	Description
SetRelatedIndexesResponse	Structure containing response
RelatedIndexSets	Structure containing one or more related index sets
RelatedIndexSet	Structure containing one related index set
FileName	Logical filename to which the annotation was added
Indexes	Structure containing one or more indexes added to annotation
Index	Index added to annotation

GetRelatedIndexes

This function retrieves information from logical file descriptions about annotations indicating an index file which is related to a data file.

Sample Input XML

```
<GetRelatedIndexesRequest>
  <FileNames>
      <FileName>Tutorial::JD::TutorialPerson</FileName>
  </FileNames>
</SetRelatedIndexesRequest>
```

Request Tag Descriptions

Tag Name	Req?	Description
SetRelatedIndexesRequest		Structure containing request
FileNames	Y	Structure containing one or more related index sets
FileName	Y	Logical filename to which the annotation is added

Response Tag Descriptions

Tag Name	Description
GetRelatedIndexesResponse	Structure containing response
RelatedIndexSets	Structure containing one or more related index sets
RelatedIndexSet	Structure containing one related index set
FileName	Logical filename to which the annotation was added
Indexes	Structure containing one or more indexes added to annotation
Index	Index added to annotation

Common Structures

These structures are returned in several methods.

Exceptions Structure

Tag Name	Description
Exceptions	Structure containing one or more exceptions
Exception	Structure containing one exception
Code	Code
Audience	Audience
Source	Source component
Message	Error message

Workunit Structure

The workunit structure contains many tags which provide useful information for development and debugging of ECL code. Most of them are outside of the scope of this document. Only those that are useful when using the WsSQL service are listed here.

Tag Name	Description
Workunit	Structure containing Workunit details
Wuid	Workunit Id (WUID)
Owner	Job Owner (if any)
Cluster	Target Cluster
Jobname	Job Name (If any)
StateID	State ID
State	State (compiled, failed, etc)
Protected	Boolean indicator: Is Workunit protected?
Snapshot	Snapshot
IsPausing	Boolean indicator of pause state
ThorLCR	Boolean indicator
EventSchedule	Boolean indicator
TotalClusterTime	Time taken to process on cluster
Query	Query
Result	Structure containing result (if any)

Supported SQL Grammar

CALL

Call *queryName* **([***paramList***])**

queryName	The published query name or alias
paramList	The parameters exposed by the published query (comma-separated)

Call executes a published ECL query as if it were a stored procedure.

Example:

```
Call SearchPeopleByZipService ('33024')
```

SELECT

select [distinct**]** *columnmList* **from** *tableList* **[**USE INDEX*(indexFileName* | NONE *)***]**

[where *logicalExpression***] [group by** *columnList*[1]**] [having** *logicalExpression*[2]**]**

[order by *columnList*[1] [asc | desc]] **[LIMIT** *limitNumber***]**

NOTE: Identifiers can be unquoted or within double quotes, literal string values must be single quoted.

columnList	columnreference1[,columnreference2,columnreference3,...,columnreference*n*]
	The column(s) to return (comma-separated list). In addition, these aggregate functions are supported : COUNT, SUM, MIN, MAX, and AVG. These work in a similar manner as their ECL counterparts
columnreference	[tablename.]columnname[[AS] alias]
distinct	[distinct] col1, col2,... col*n*
	The result set will only contain distinct (unique) values
tableList	tableref1[,tableref2,tableref3,...,tableref*n*]
	One or more tables, separated by commas.
	NOTE: A table list with multiple tables creates an (one or more) implicit inner join using the where clause logical expression as the join condition which must contain an equality condition
tableref	tableName[[AS] alias]
	The Name of the table as referenced, optionally defining its alias
alias	The alias used to refer to the corresponding table or field reference.
logicalExpression	Logical expression based on standard SQL filtering syntax.
	BOOLEAN Only supports *True* or *False*, do not use Y, N, 0, or 1
	Valid operators:
	= Equal (e.g., age=33)
	<> Not equal (e.g., age <>33)
	> Greater than (e.g., age >55)
	< Less than (e.g., age < 18)
	>= Greater than or equal (e.g., age >=21)
	<= Less than or equal (e.g., age <=21)
	IN(value1,value2,...,value*n*) where values are comma separated homogeneous types
	NOT IN(value1,value2,...,value*n*) where values are comma separated homogeneous types
	LIKE *pattern* where the pattern uses SQL LIKE operators with % and _ wildcards.
	NOT LIKE *pattern* where the pattern uses SQL LIKE operators with % and _ wild-cards.
limitNumber	The number of rows to return. This overrides the default configuration attribute (EclResultLimit) but cannot be set to ALL

[1]Aliasing not supported

[2]Can only contain references to aggregate functionsif used with *having* clause.

Aggregate functions can only be expressed in logicalExpressions by using *Group by*and *having*

Examples:

```
Select * from tableList where Sum(F1 > 100) /* is NOT SUPPORTED */
Select * from tableList Group by F1 Having Sum (F1 > 100) /* IS SUPPORTED */
```

Example:

```
Select fname, lname, state from TutorialPerson where
   state='FL' OR (lname='Smith' and fname='Joe')
//returns data that looks like this:
John Doe FL
Jim Smith FL
Jane Row FL
Joe Smith CA

Select fname, lname, state from TutorialPerson where state='FL' AND lname <> 'Smith'
//returns data that looks like this:
John Doe FL
Jane Row FL

Select fname, lname, state from TutorialPerson where state='FL' AND lname like 'Smi%'
//returns data that looks like this:
Jim Smith FL

Select fname, lname, state from TutorialPerson where
   state='FL' OR (lname='Smith' and fname='Joe') AND fname NOT LIKE 'Ji%'
//returns data that looks like this:
John Doe FL
Jane Row FL
Joe Smith CA
```

The interface supports SQL index hints, which gives the SQL user the option to specify the most appropriate HPCC Systems index for the current SQL query. This also allows you to disable the use of an index.

select *columnList* **from** *tableName* **USE INDEX(***hpcc::index::file::name***) where** *logicalExprssions*

USE INDEX(none) forces the system to avoid seeking an index for the current query.

Example:

```
Select fname, lname, zip, state from TutorialPerson
USEINDEX(TutorialPersonByZipIndex)where zip='33024'

//returns data that looks like this:
John Doe FL 33024
Jim Smith FL 33024
Jane Row FL 33024
```

A Select query returns two dataset outputs per request. The second dataset (named WsSQLCount) provides the total result count. This is useful when paging results.

Example:

```
<Dataset name='WsSQLResult'>
  <Row>
    <yearbuilt>1203</yearbuilt>
    <id>4</id></Row>
  <Row>
    <yearbuilt>2003</yearbuilt>
```

```
    <id>5</id></Row>
</Dataset>
<Dataset name='WsSQLCount'>
  <Row>
    <WSSQLSelectQueryResultCount>2</WSSQLSelectQueryResultCount>
  </Row>
</Dataset>
```

SELECT JOIN

select *columnList* **from** *tableName* ***[as*** *alias**]***

[<outer | inner > **JOIN** *join TableName* **[as** *alias***] on** *joinCondition***]**

[USE INDEX*(*indexFileName | NONE *)*]

[**where** *logicalExpression]* [**group by** *fieldName*]

[**order by** *columnNames* [asc | desc]] [**LIMIT** *limitNumber*]

columnList	columnreference1[,columnreference2,columnreference3,...,columnreference*n*]
	The column(s) to return (comma-separated list). In addition, these aggregate functions are supported : COUNT, SUM, MIN, MAX, and AVG. These work in a similar manner as their ECL counterparts.
columnreference	[tablename.]columnname[[AS] alias]
distinct	[distinct] col1, col2,... col*n*
	The result set will only contain distinct (unique) values.
alias	The alias used to refer to the corresponding table or field reference.
outer | inner	The type of JOIN to use. Note: The WsSQL service currently supports INNER JOIN or OUTER Joins. An OUTER JOIN is converted to a FULL OUTER JOIN internally.
joinTableName	The JOIN file to use.
joinCondition	Specifies the relationship between columns in the joined tables using logical expression.
logicalExpression	Logical expression based on standard SQL filtering syntax.
	BOOLEAN Only supports *True* or *False*, do not use Y, N, 0, or 1.
	Valid operators:
	= Equal (e.g., age=33)
	<> Not equal (e.g., age <>33)
	> Greater than (e.g., age >55)
	< Less than (e.g., age < 18)
	>= Greater than or equal (e.g., age >=21)
	<= Less than or equal (e.g., age <=21)
	IN(value1,value2,...,value*n*) where values are comma separated homogeneous types.
	NOT IN(value1,value2,...,value*n*) where values are comma separated homogeneous types.
	LIKE *pattern* where the pattern uses SQL LIKE operators with % and _ wildcards.
	NOT LIKE *pattern* where the pattern uses SQL LIKE operators with % and _ wildcards.
limitNumber	Optional. The number of rows to return. This overrides the default configuration attribute (`EclResultLimit`) but cannot be set to ALL.

[1]Aliasing not supported

[2]Can only contain references to aggregate functionsif used with *having* clause.

Aggregate functions can only be expressed in logicalExpressions by using *Group by*and *having*

Examples:

```
Select * from tableList where Sum(F1 > 100) /* is NOT SUPPORTED */
Select * from tableList Group by F1 Having Sum (F1 > 100) /* IS SUPPORTED */
```

Example:

```
Select t1.personname, t2.address
       from persontable as t1 inner join addresstable as t2
       on (t1.personid = t2.personid AND
           (t1.firstname = 'jim' AND
            t1.lastname  = 'smith' ))
```

The interface does not convert parameter list or column list values to string literals.

String values should be single quote encapsulated. Field identifier can be left unquoted or double quoted.

For example, the table **persons** has columns lastname(String) and Zip (numeric)

```
Select Firstname from persons where lastname = 'Jones' and zip > 33445    /* works  */

Select Firstname from persons where lastname = 'Jones' and "zip" > 33445    /* also works  */

Select Firstname from persons where lastname = Jones and zip > 33445     /* doesn't work */

Select Firstname from persons where lastname = 'Jones' and zip > '33445'   /* doesn't work */
```

CREATE / LOAD

create table [if not exists] *newtablename* **'('(***fieldname***(***fieldtype***[***fieldlen***[**,*precision*]][UNSIGNED][,]))+')'**

[comment 'commenttext'**][;]**

load data infile '*sourcetablename*' **[connection** '*landingzoneIP*' **directory** '*landingzonepath*'**]**

into table *newtablename*

[(fields | columns) [terminated by '*fieldDelimiter*'**] [enclosed by** '*quoteChar*'**] [escaped by** '*escapeChar*'**]]]**

[lines [terminated by '*recordDelimiter*'**]][;]**

The CREATE TABLE and LOAD DATA SQL statements allow you to create a file in an HPCC Systems cluster that is accessible via WsSQL. You can populate the new file from data in a logical file already on the HPCC Systems cluster or one that is on a landing zone.

All Create requests MUST be accompanied by a Load request. You cannot create a table with the intention to load or insert data later.

newtablename	The logical filename to create on the HPCC Systems cluster. **Note:** Create and Load must target the same file.
commenttext	A text comment to add to the logical file's description
sourcetablename	The source file from which to extract data to load into the new table. This can be a logical file on an HPCC Systems cluster or a physical file on a landing zone. For a landing zone file, you MUST provide a **connection** '*landingzoneIP*' and a **directory** '*landingzonepath*' (the path to the file). For a landing zone file, be sure to use matching case for the filename.
landingzoneIP	The IP Address or hostname of the HPCC Systems Landing Zone
landingzonepath	The path to the datafile on the Landing Zonebut
fieldDelimiter	String value for field delimiter
quoteChar	String Value for the quote character
escapeChar	String Value for the escape character
recordDelimiter	String value for record delimiter

Examples:

```
CREATE  TABLE newCustomerFile (id DECIMAL( 30, 5), mytint INT(9),
                               mydouble DOUBLE (5,3) UNSIGNED)
COMMENT 'this file created via WsSQL and populated from file on lz';
LOAD DATA INFILE 'CustomerData' CONNECTION '127.0.0.1'
                               DIRECTORY '/var/lib/HPCCSystems/mydropzone'
INTO TABLE newCustomerFile;

CREATE  TABLE newCustomerFile2 (id DECIMAL( 30, 5), mytint INT(9),
                               mydouble DOUBLE (5,3) UNSIGNED)
COMMENT 'this file created via WsSQL and populated from sprayed file';
LOAD DATA INFILE 'thor::customerdata::customers' INTO TABLE newCustomerFile2

CREATE  TABLE IF NOT EXISTS newCustomerFile3 (id DECIMAL( 30, 5), mytint INT(9),
                                              mydouble DOUBLE (5,3) UNSIGNED)
COMMENT 'won't overwrite';
LOAD DATA INFILE 'thor::customerdata::customers' INTO TABLE newCustomerFile3
```

```
CREATE  TABLE newCustomerFile4CSV (id DECIMAL( 30, 5), mytint INT(9),
                                   mydouble DOUBLE (5,3) UNSIGNED)
COMMENT 'Loading CSV data';
LOAD DATA INFILE 'somecsvfile.csv'  FIELDS TERMINATED BY ',' ENCLOSED BY '"'
                                    LINES TERMINATED BY 'n'
INTO TABLE newCustomerFile4CSV
```

Supported Aggregate Functions

COUNT([DISTINCT]*columnName*)

DISTINCT(*columnName*)

SUM(*columnName*)

MIN(*columnName*)

MAX(*columnName*)

AVG(*columnName*)

These aggregate functions are supported. They behave as their ECL counterparts. See the **ECL Language Reference** for details.

COUNT	Counts the occurrences of columnName in the result, always an integer.
DISTINCT	Returns only distinct values of columnName in the result, output type is dependent on input type.
SUM	Returns the sum of the values of columnName in the result, output type is dependent on input type.
MIN	Returns the minimum value for of columnName in the result, output type is dependent on input type.
MAX	Returns the minimum value for of columnName in the result, output type is dependent on input type.
AVG	Returns the average of the values of columnName in the result, always a real number.
columnName	The column to aggregate.

Example:

```
Select fname, lname, state, COUNT(zip) from TutorialPerson where zip='33024'
```

Supported String Modifiers

UPPER(*columnName*)

LOWER(*columnName*)

UPPER	Returns with all lower case characters converted to upper case.
LOWER	Returns with all upper case characters converted to lower case.
columnName	The column to aggregate

Special considerations

Since this service uses both ECL and SQL, there are a few special considerations when designing the backend databases and stored procedures.

Reserved SQL Keywords

Your HPCC Systems identifiers (field names, Stored Procedure names, etc) cannot use SQL reserved words such as:

```
ADD ALL ANY AS ASC AT AVG BETWEEN BOOL BOOLEAN BY CALL COLUMN CONTAINS COUNT
DESC DISTINCT FALSE FOR FROM GROUP HAVING IN INDEX INNER IS JOIN KEY KEYS LAST
LEFT LIKE LIMIT LOWER MAX MIN MOD NOT NULL OFFSET ON ORDER OUT OUTER POWER SELECT
SUM TABLE TRUE UPPER USE WHERE XOR DIV MOD OR AND
```

Special Characters

Your HPCC Systems filenames should avoid special characters other than:

```
( 'A'..'Z' | 'a'..'z' | '' | '$') ( 'A'..'Z' | 'a'..'z' | '' | '$' | '0'..'9' )
File names can be prefixed with a ~ (tilde) or .::
```

If a filename is not supported, it will not be returned when interrogating the system using GetDBMetaData.