



BlastLogic

BlastLogic Integration Service



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1

Introduction

The BlastLogic Integration Service (BLIS) facilitates data exchange from third-party databases into the BlastLogic system. Using the BlastLogic Desktop client, the user will select loaded drilling events by shift, associate the events with design holes and validate the as-drilled data.

This document is intended to assist customers in understanding the system architecture and determining the requirements for interfacing with 3rd party data sources.

CONSTRAINTS

Timeliness

Though BLIS can be configured to poll site-based drilling system every five minutes, the system is constrained by the configured update frequency of the site-based drilling systems and the reliability of each system to indicate that drilling activities are completed on a given hole. Both of these constraints are deemed to be the responsibility of customer.

For example: if, for whatever reason, an event that flags the relocation of a drill rig from one hole to another were not recorded by a site-based drilling system then BLIS would not consider drilling as completed until after some configured time period, longer than the polling interval. Hence, the transfer of this drilling data would be delayed.

Site Operations

Optional site processes that affect accurate collection of drilling data may impact the accuracy and completeness of data acquisition. Where these are discovered during the course of implementation, improvements to site processes may be recommended.

Fields in the imported drilling data that are missing or need to be derived/inferred will be transferred as **null** (i.e. without a value) into the BlastLogic system. This may affect subsequent validation processes in the BlastLogic Desktop client. For example, hole diameter is important in the calculation of charge plans. If the source drilling data does not include a diameter measurement, then calculations within the BlastLogic system would use the design diameter value instead.

Source Database Queries

- BLIS can be configured to execute arbitrary queries directly against each source database.
- Views may be created in each of the source databases to provide the same result as would a direct query against the underlying database.
- Data may also be made available in a data warehouse instead of providing direct access to the canonical source database. This may provide performance and reliability benefits on large source database but can also result in increased lag time and operational overhead.

- Source tables should be indexed and views should be implemented to ensure that queries filtering on drill *CompletionTime* are efficient.
- The creation and maintenance of source system data views and staging tables is the responsibility of the customer, though Maptek can be of assistance in developing queries.

2

Drilling Data Integration Requirements

The BlastLogic Integration Service (BLIS) can interface with drill navigation systems that make as-drilled data available in a relational database.

These are some of the drill navigation systems that have been successfully integrated on customer sites:

- Atlas Copco
- Caterpillar Aquila and Terrain
- FLANDERS ARDVARC
- Leica IMS/Tritronics and Jmineops
- Modular Mining ProVision
- ROCKMA
- Wenco (APS)

Support for other systems can typically be implemented by the development of appropriate queries and/or views.

DRILLING IMPORT DEFINITION

The BlastLogic system supports importing built-in and custom fields for imported drilling data.

Built-in Fields

Import Field	Data Type	Description	Units	Sample	Required
Id	Text	Used to uniquely identify drilling events.		X8758A86R8	Yes
HoleName	Text	Name of the hole.		ABCD1234	No
CollarX	Decimal	Easting of the collar.	metre	10239.22	No
CollarY	Decimal	Northing of the collar.	metre	20392.45	No
CollarZ	Decimal	Elevation of the collar.	metre	104.3	No
Depth	Decimal	Drilled depth of the hole (as measured along the hole, not vertically).	metre	20.2	No
Diameter	Decimal	Diameter of the hole.	metre	0.5	No
Angle	Decimal	Angle of the hole.	degree	5.2	No
Bearing	Decimal	Bearing of the hole.	degree	11	No
Operator	Text	Name of the drill operator.		John Smith	No
DrillMachine	Text	Identifier of the Drill Rig.		JKR-2	Yes
Comment	Text	Allows free text to be entered against the hole.		Touched coal	No
StartTime	Date-time	The date & time that the hole drilling was started.	UTC	2015-03-20 13:45:10.000	No
CompletedTime	Date-time	The date & time that the hole drilling was completed.	UTC	2015-03-20 13:55:29.001	Yes

Table 2-1: BlastLogic Drilling Event built-in import fields

Validation

The only import fields in Table 2-1 that are mandatory for BlastLogic are Id, DrillMachine and CompletedTime. The hole name and/or collar position are also necessary to associate a drilling measurement with a design hole using the BlastLogic Desktop client.

Required fields aside, extracted records are never rejected by the BlastLogic Integration Service. The fields presented by the source system are expected to contain data of the appropriate type (e.g. numeric values in number fields, date-time values in date-time fields).

Transformation

BLIS requires the values from source to be converted to the units specified in Table 2-1. **The BLIS view adapter query can be used to implement unit conversions and time zone offsets as required.**

The spatial coordinate system used by each source system must match the coordinate system configured for the target BlastLogic site.

MEASURE WHILE DRILLING (MWD) IMPORT DEFINITION

The BlastLogic system supports importing built-in and custom fields for imported MWD data.

Built-in Fields

Import Field	Data Type	Description	Units	Sample	Required
Id	Text	Used to uniquely identify the drilling event the owns the drill measurement.		X8758A86R8	Yes
Top	Decimal	The highest point of this drill measurement	metre	11.3	Yes
Bottom	Decimal	The lowest point of this drill measurement	metre	11.4	Yes

Table 2-2: BlastLogic Drill Measurement built-in import fields

Validation

The only fixed fields in Table 2-2: BlastLogic Drill Measurement built-in import fields that are mandatory for BlastLogic are Id, Top and Bottom. All other Drill Measurement data is imported into custom drill measurement properties defined in the BlastLogic Desktop client.

The fields presented by the source system are expected to contain data of the appropriate type (e.g. numeric values in number fields, date-time values in date-time fields).

A Drill Measurement will be rejected if any of the following are true

- Top is deeper than Bottom.
- If a new drill measurement overlaps an existing drill measurement.
- If two new drill measurements overlap each other the first drill measurement will be imported. The second drill measurement will be rejected.

Transformation

BLIS requires the values from source to be converted to the units specified in Table 2-2: BlastLogic Drill Measurement built-in import fields. **The BLIS view adapter query can be used to implement unit conversions and time zone offsets as required.**

GENERAL

Custom Fields

Custom drilling properties may be created using the BlastLogic Desktop client and populated using arbitrary fields made available as columns of the source system query.

The following custom property types and source column mappings are supported:

	Source Query Column Types			Values
	SQL Server	Oracle	PostgreSQL	
Drilling custom property type				
Boolean	BIT INT VARCHAR(X) NVARCHAR(X)	NUMBER (1) VARCHAR(X) VARCHAR2(X)	boolean integer varchar(x) varchar(x)	1 == True, 0 == False Not 0 == True, 0 == False "True" == True, "False" = False "True" == True, "False" = False
Float	DECIMAL REAL FLOAT	FLOAT	real double	
String	VARCHAR(X) NVARCHAR(X)	VARCHAR(X) VARCHAR2(X)	varchar(x) varchar(x)	Must comply with the single/multi-line nature of the drilling custom property.
Select	VARCHAR(X) NVARCHAR(X)	VARCHAR(X) VARCHAR2(X)	varchar(x) varchar(x)	Must be a select option identifier registered for the drilling custom property.
Multi-select	VARCHAR(X) NVARCHAR(X)	VARCHAR(X) VARCHAR2(X)	varchar(x) varchar(x)	Must be a comma separated list of multi-select option identifiers registered for the drilling custom property.

Each data source query defines a number of columns, most of which are fixed columns directly supported by BLIS. These are mapped to built-in BlastLogic drilling event or drill measurement properties.

BLIS attempts to map all additional columns to custom properties by matching the column name to the custom property identifier. If a column in the source system does not correspond to a custom property in BlastLogic the column will be ignored.

Mapping conventions:

- The name of the data view column must match the BlastLogic drilling custom property identifier exactly.
- Select and multi-select option values must match the BlastLogic drilling custom property options exactly.
- Multi-select option values are comma delimited (so BlastLogic custom drilling property schema multi-select option values must not contain commas).
- The type of the source data query column must be convertible to the target custom property type (see table above)
- Null values (and empty strings) will be ignored and excluded from the custom property values uploaded to the BlastLogic Server.
- Numeric (float) property values must be provided in SI units with respect to the target custom property dimension, but with the following exceptions:
 - Temperature: degrees Celsius
 - Angle: degrees

Accuracy

All date-time values maintained in the BlastLogic databases have at least millisecond precision. The *CompletedTime* column is principally used by the BlastLogic system for selection of drilling records, determining the working shift and to infer the drilling order. Hence, millisecond precision is sufficient and minor time drift should not have significant impact.

BLIS extracts drilling events and drill measurements from source systems by filtering on the *CompletedTime* column. The *Id* column is used to uniquely identify a drilling event. The *Id*, *Top* and *Bottom* columns are used to uniquely identify a drill measurement. The *Id* column of a drill measurement is the identifier of the drilling event that owns the drill measurement.

There is no impact on accuracy in the event of a drill rig losing connectivity, buffering the drilling data and subsequently uploading it. The value of the *Id* column must be unique to each hole actually drilled and must be stable.

SOURCE SYSTEMS

Drill navigation source systems typically store their data in Oracle, SQL Server or PostgreSQL databases. BLIS will connect to each source system using a connection string which may use Integrated Windows Authentication (using the service account identity) or explicit credentials.

Atlas Copco Surface Manager

Surface Manager stores drilling events in a SQL Server database which can be queried directly by BLIS.

The view does not provide Drill Depth, Angle or Bearing as such, and so these are calculated by BLIS using the raw start and end point X/Y/Z values.

Times are specified in local time and must be adjusted to UTC using a view or the BLIS query.

Additional fields including DrillBitId and AveragePenetrationRateInMetersPerMinute are available for populating custom drilling properties.

Caterpillar Aquila & Terrain

CAT Aquila and CAT Terrain can store drilling events using a SQL Server database or Oracle database which can be queried directly by BLIS.

Hole profile averages such as rate of penetration, torque and air pressure can be extracted from some CAT databases for populating custom drilling properties.

Consumption data for drill bits and steels can be extracted from some CAT databases for populating custom drilling properties.

Leica IMS

Leica IMS typically stores drilling events in a SQL Server database which can be queried directly by BLIS.

Leica Jigsaw / Jmineops

Leica Jmineops stores drilling events in a SQL Server database which can be queried directly by BLIS. Angle and bearing are calculated from the toe and collar coordinates.

Tags logged by the operator can be used to populate custom drilling properties such as top-of-coal and broken ground.

Modular Mining Provision

Version 2

Version 2 is implemented on a proprietary file system based database which cannot be queried directly by BLIS. Modular have developed a custom module to export drill data to CSV files on a timer, and BLIS can process these files.

This provider is provided for legacy source support only. Only the basic built-in fields are available in the CSV files.

Version 3

Version 3 stores drilling events in a SQL Server database which can be transformed for querying by BLIS.

Modular Mining Provision does not implement referential integrity in the database via foreign-key constraints. Querying such a database involves structural assumptions and additional validation steps that can make extracting consistent and correct data challenging.

Wenco (APS)

The Wenco (APS) drill navigation system database includes a view named 'mineApsViewDrillHolesOperator' which can be queried by BLIS to populate the built-in fields.

Angle and bearing are calculated from the toe and collar coordinates.

Other

Other source systems that store drilling events in SQL Server, Oracle, PostgreSQL or support ODBC can usually be readily accessed by BLIS by developing a view adapter query that includes at least the required fields listed in Table 2-1: BlastLogic Drilling Event built-in import fields.

Drill navigation system vendor assistance is generally required to develop such a query, and this is the responsibility of the customer. Maptek can assist where required.

Maptek has a library of such queries developed for common source systems which may shorten the development and testing process.

3

Custom Hole Property Integration Requirements

The BlastLogic Integration Service (BLIS) can update custom hole property values by polling relational databases using configurable 'view adapter' queries.

This can be useful for importing automated hole measurements like temperature. The values can subsequently be visualised using the Desktop or Tablet clients or incorporated in charge rule calculations.

BLIS extracts hole property values from source systems by filtering on a *TimeStamp* column. A 'look back' duration is configured to determine how far the query should look back in time for hole property changes.

The most recent value for each hole property over the look back period is then compared against the BlastLogic server data. If any of the values are different, the BlastLogic Server hole property (or properties) are updated.

QUERY REQUIREMENTS

BlastLogic supports updating custom hole properties only, not built-in properties.

A query must be developed in the form of a view adapter. The query must return the following required columns and one or more custom property columns. The values in the custom property columns are mapped to the custom hole properties.

Time stamp values must be in the UTC time zone. Source systems using local time values may be able to convert back to UTC using the view adapter query.

Required Columns

Import Field	Data Type	Description	Units	Sample
HoleId	int	The date and time that the hole drilling was started.	-	12345
TimeStamp	Date-time	The date and time of creating the custom hole property or the date and time of the last custom hole property update.	UTC	2015-03-20 13:55:29.001

Table 3-1: BlastLogic Hole Property built-in import columns

The HoleId corresponds to the internal BlastLogic hole identifier as exposed in the OData / Data Warehouse Holes feed.

Custom Property Columns

Custom hole properties may be created using the BlastLogic Desktop client and populated using column values in the source system query.

The following custom property types and source column mappings are supported:

	Source Query Column Types			
Hole custom property type	SQL Server	Oracle	PostgreSQL	Values
Boolean	BIT	NUMBER (1)	boolean	1 == True, 0 == False
	INT		integer	Not 0 == True, 0 == False
	VARCHAR(X)	VARCHAR(X)	varchar(x)	"True" == True, "False" = False
	NVARCHAR(X)	VARCHAR2(X)	varchar(x)	"True" == True, "False" = False
Float	DECIMAL	FLOAT	real	
	REAL		double	
	FLOAT			
String	VARCHAR(X)	VARCHAR(X)	varchar(x)	Must comply with the single/multi-line nature of the drilling custom property.
	NVARCHAR(X)	VARCHAR2(X)	varchar(x)	

Select	VARCHAR(X) NVARCHAR(X)	VARCHAR(X) VARCHAR2(X)	varchar(x) varchar(x)	Must be a select option identifier registered for the drilling custom property.
Multi-select	VARCHAR(X) NVARCHAR(X)	VARCHAR(X) VARCHAR2(X)	varchar(x) varchar(x)	Must be a comma separated list of multi-select option identifiers registered for the drilling custom property.

Table 3-2: BlastLogic Hole Property column type mappings

BLIS attempts to map all non-required columns to custom properties by matching the column name to the custom hole property identifier. If a column in the source system does not correspond to a BlastLogic custom hole property, the column will be ignored.

Mapping rules:

- The name of the query column must match the BlastLogic custom hole property identifier exactly.
- Select and multi-select option values must match the BlastLogic custom hole property options exactly.
- Multi-select option values are comma delimited (so BlastLogic custom hole property schema multi-select option values must not contain commas).
- The type of the source data query column must be convertible to the target custom property type (see table above)
- Numeric (float) property values must be provided in SI units with respect to the target custom property dimension, but with the following exceptions:
 - Temperature: degrees Celsius
 - Angle: degrees
- BlastLogic does not support date/time custom properties as such. Customers wanting to import date/time values should convert the values to a string and target a string-type custom property.
- NULL values will be applied to BlastLogic by deleting the property value for that hole.

SOURCE SYSTEM REQUIREMENTS

Source systems that store hole property values in SQL Server, Oracle, PostgreSQL or that support an ODBC driver can usually be accessed by BLIS by developing a view adapter query that includes at least the required fields listed in Table 2-1: BlastLogic Drilling Event built-in import fields.

BLIS will connect to each source system using a connection string which may use Integrated Windows Authentication (using the service account identity) or explicit credentials.

QUERY EXAMPLE

Consider a third-party system providing values for temperature, whether the hole is wet, and arbitrary notes.

A query returning the following rows:

	HoleId	TimeStamp	Temperature	IsWet	Notes
1	12345	2022-08-16 13:45:00.0000000	40	0	Heating up
2	12345	2022-08-16 16:00:00.0000000	32.3	1	Cooled down
3	33333	2022-08-16 14:00:00.0000000	41.2	0	NULL
4	33333	2022-08-16 15:10:00.0000000	40.3	0	NULL
5	33333	2022-08-16 19:33:00.0000000	39.8	0	NULL

Would result in:

- For hole 12345:
 - If a custom property 'Temperature' of type float exists, the value would be set to 32.3
 - If a custom property 'IsWet' of type boolean exists, the value would be set to True
 - If a custom property 'Notes' of type string exists, the value would be set to 'Cooled down'
- For hole 33333:
 - If a custom property 'Temperature' of type float exists, the value would be set to 39.8
 - If a custom property 'IsWet' of type boolean exists, the value would be set to False
 - If a custom property 'Notes' of type string exists, the value would be deleted

4

Architectural and Component-level Design

LOGICAL ARCHITECTURE

The BlastLogic Integration Service (BLIS) comprises a configurable scheduler that polls Drill Navigation databases (sources) for new drilling events and loads them into BlastLogic Server sites (targets).

BLIS is hosted as a Windows Service and can be monitored and configured using a web site hosted by the service.

Source systems are polled according to a configured schedule, drilling events and drill measurements are extracted for a defined period and then compared with the data in the target BlastLogic Site. Any new records are then uploaded to the site ready for validation. BLIS will update drilling events and drill measurements as new data becomes available in the source system. Drilling entries will be updated according to the drilling source preferences.

As new events are uploaded to the site, BLIS attempts to auto-associate and validate the events against any designed drill holes that are not yet associated. Events that cannot be automatically auto-associated and validated must be processed manually, typically by the Drill and Blast Engineer on duty.

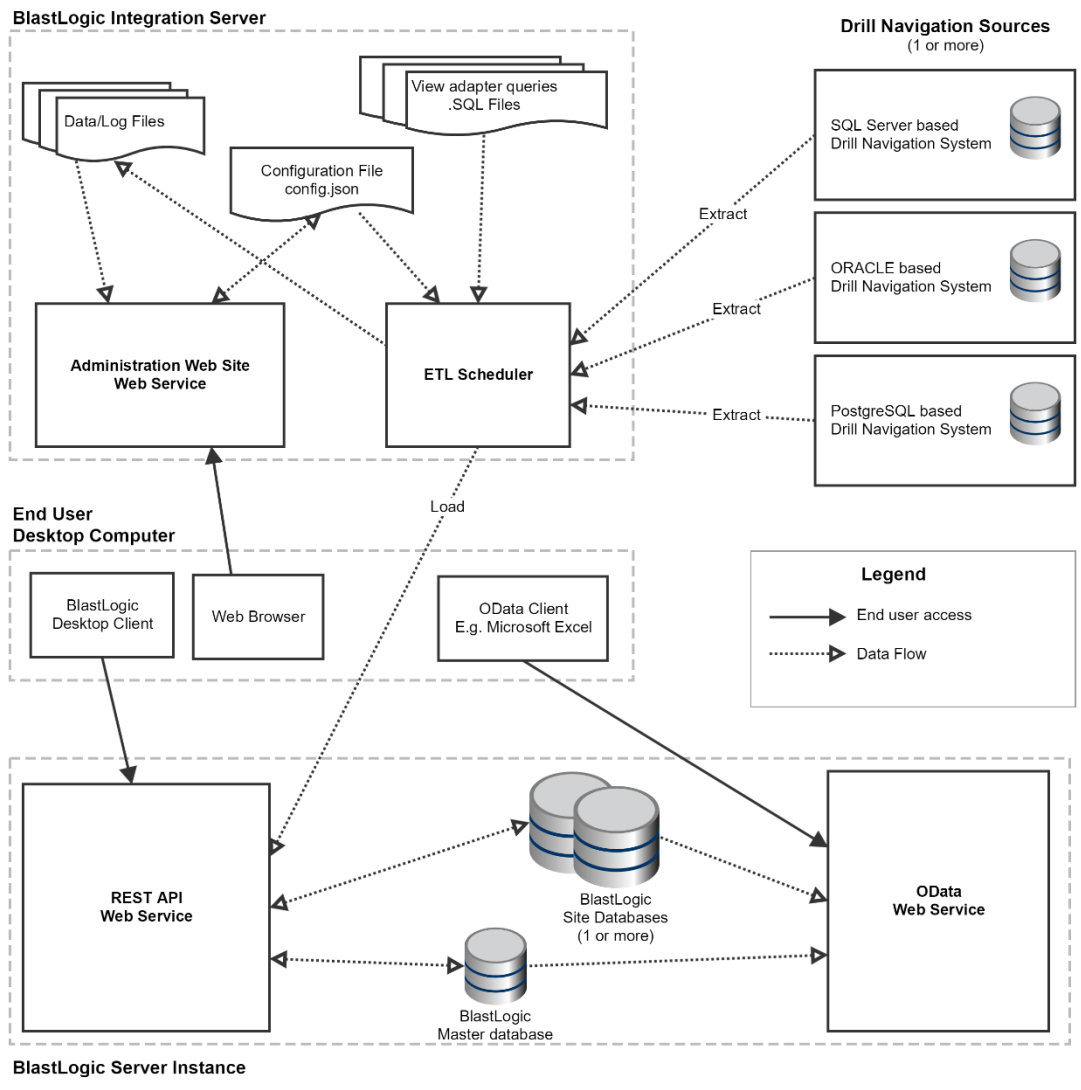


Figure 4-1: Logical Architecture

PHYSICAL ARCHITECTURE

The BLIS service is intended to be implemented on a Windows Server machine (typically a VM) that runs 24/7 and integrates with existing infrastructure in a central data centre.

BLIS is a lightweight service that imposes minimal load on the host machine. It cannot fulfil its purpose without access to at least one target BlastLogic Server, so it is typically co-hosted on the machine hosting BlastLogic Server – as shown in **Figure 4-2**.

The Drill Navigation Sources built upon RDBMS like SQL Server, Oracle and PostgreSQL are typically provisioned and maintained separately by the vendor. These systems may be located on-site, in a central data centre, or replicated from site to a central data centre.

Though it is possible to deploy multiple instances of BLIS (e.g. one per site) it is usually not necessary. A single instance in a central datacentre is usually sufficient and requires less resources to manage.

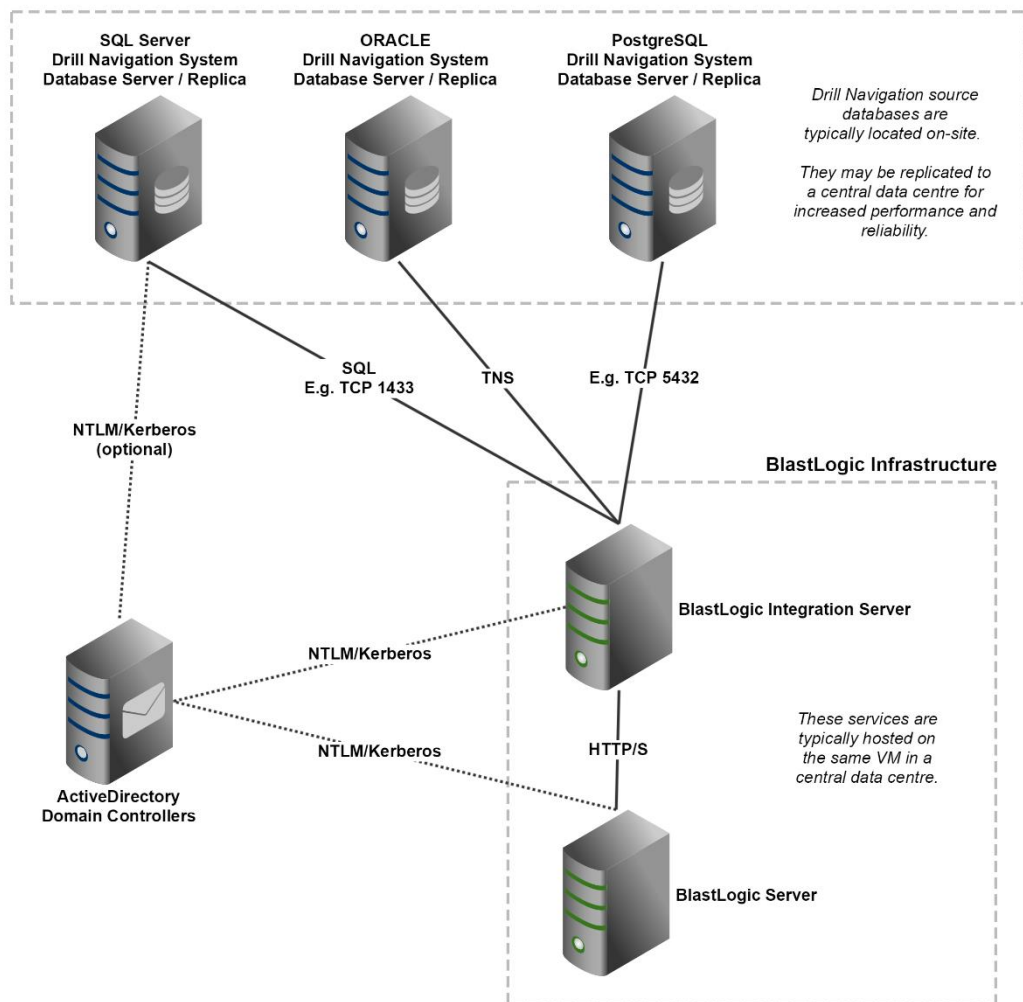


Figure 4-2: Physical Architecture

PROCESSES

The BLIS scheduler applies the following processes to each enabled source-target mapping:

1. Extract
2. Transform
3. Load
4. Associate and Validate

Extraction from Sources

Access to the site-based source system databases is established via a configurable Drilling Event Provider which acts as a bridge for read-only access to site-based data sources and provides transformation of the representation of source drilling data.

Drilling Event Providers are available for Microsoft SQL Server, Oracle and PostgreSQL databases. A Drilling Event Provider for ODBC source is also available and can be used for sources that are not explicitly supported.

Each source is configured to use a provider that either queries a view directly or executes a query defined in a view adapter SQL file. View adapter queries afford flexibility of implementation, allowing addition of site-based data sources without creation of a view in the Drill Navigation Vendor supported/controlled database. All queries are implemented as dynamic SQL and are executed by the BlastLogic Integration Service Windows Service host.

A source must be configured to execute a query to extract drilling events. A source can optionally be configured to execute a query that extracts drill measurements. The queries must include a *StartTime* and *EndTime* parameter. The queries must return any record where the *CompletedTime* field is between the *StartTime* and *EndTime* parameters.

Connections to site-based sources will be established by the BlastLogic Integration Service using the configured credentials provided by the customer. Different providers support different authentication options which are configured using ADO.NET connection strings. SQL Server sources can be configured for Integrated Windows Authentication or explicit credentials, whereas Oracle and PostgreSQL typically use explicit credentials. ODBC sources can be defined in the connection string or directly in the DSN.

Note: As all queries filter on the *CompletedTime* field it is important that the *CompletedTime* field be a fixed database field and not calculated. Calculated fields can significantly decrease the performance of SQL queries.

Transformation and Validation of Drilling Data

When records are extracted, the columns are mapped by matching names to the corresponding properties in the BlastLogic Drilling Event and Drill Measurement data models. Types in the source view must be convertible to the property types defined in the corresponding data model. Units must be as specified in the Drilling Import Definition section.

Source rows that do not provide values for any required properties are discarded.

Loading into BlastLogic Targets

The BlastLogic Server REST API provides an endpoint via which drilling events and drill measurements are loaded into the target BlastLogic Site database.

When a source column does not have a corresponding fixed field or custom property in the target system the column is ignored. If any custom property values cannot be loaded into the target due to mismatched type, all custom property values are discarded.

The service account under which the BLIS service is running must be registered as a BlastLogic *user* configured with appropriate role assignments. A fixed 'Integration' role is provided for this purpose.

When a drilling event row specifies a Drilling Rig or Drill Operator values that do not exist in the target site, the Drilling Rig or Drill Operator is automatically added by BLIS.

When a drilling event is imported into BlastLogic and subsequently changes BLIS will attempt to update that field. When a Drill Measurement is imported into BlastLogic and a property is subsequently changed BLIS will update that field. BLIS will always attempt to keep BlastLogic data consistent with the source system.

Association and Validation against Design

Drilling events loaded in to a BlastLogic site need to be associated with a design drill hole and validated where appropriate. Only when an event has been associated and validated will the values be applied to the design hole and flow through to subsequent calculations.

After loading events, BLIS will attempt to auto-associate drilling events according to the rules specified using the Desktop Client *Site Setup | Validation settings | Drilling auto-association* section. BLIS will attempt to automatically validate any associated drilling events according to the rules specified using the Desktop Client *Site Setup | Validation settings | Drilling auto-validation* and *Drilling source preferences* sections.

Source events that are not able to be auto-associated and validated by BLIS require manual resolution using the Desktop Client *Validate drilling* panel.

Updating Drill Data

BLIS will attempt to ensure that all drilling events and drilling event drill measurements in BlastLogic are in sync with the data in the source system. If the data in the source system changes BLIS will attempt to ensure that the corresponding records in BlastLogic are also changed.

Drilling entries will update according to the rules specified using the Desktop Client *Site Setup | Validation settings | Drilling source preferences* section.

BLIS will update null fields of drilling entry drill measurements. Non null fields of drilling entry drill measurements will be ignored.

5 Installation

OVERVIEW

This section walks through the process of building a BlastLogic Integration System (BLIS) 3.0 service.

The main components required by BLIS are:

- a BLIS instance
- a BlastLogic Server instance
- one or more drill navigation data sources

INTENDED AUDIENCE

The instructions in this document are technical in nature and should be attempted by experienced IT staff, preferably with some knowledge of the relevant source system databases like SQL Server and/or Oracle.

PREREQUISITES

- A Windows machine (VM) running 64-bit Windows.
- Local administrator rights to the machine
- A working BlastLogic Server instance
- Microsoft .NET Framework 4.6 or later installed (most likely already installed)
- A BLIS MSI installer

STEPS

Step 1: Establish an Active Directory Service Account to run the BLIS Service

Typically the existing BlastLogic Server service account is re-used. To create a dedicated account to run BLIS follow the same process.

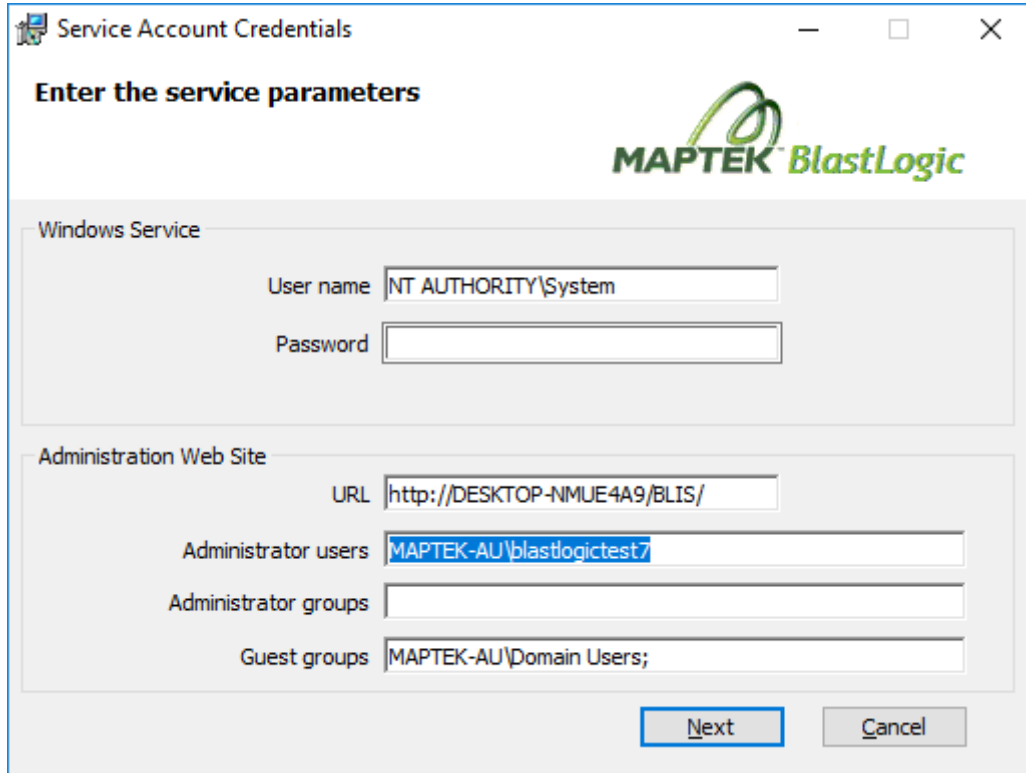
Once the service account has been established:

1. Authorise the service account as a user for the target BlastLogic Server instances, and assign it the 'Integration' role for all sites (or just the required sites).

Step 2: Install BLIS

1. Install BLIS using the supplied MSI.

2. Enter the *User name* and *Password* for the Service Account credentials from Step 1. Specify the *User*, *Administrator users* accounts, *Administrator groups* and *Guest groups* for the Administration Web Site. Click *Next*.



3. Click *Agree*.
4. Click *Finish*.
5. The BLIS web site opens and the System Log is displayed, the configuration can be viewed using the Sources and Targets pages.

Step 3: Install Oracle ODAC (OPTIONAL)

Only perform this step if Oracle data sources are to be used.

1. If Oracle data sources are to be used, download [64-bit Oracle Data Access Components \(ODAC\) Downloads](#).
2. Extract the ZIP file to a temporary folder.
3. Open a command prompt with elevated privileges (i.e. as Administrator).
4. CD to the folder created in step 1.
5. Decide where the Oracle client is to be installed, use C:\oracle\ unless it has already been used.
6. Execute the command "**install.bat all c:\oracle odac**".
7. Confirm any UAC prompts displayed during installation.
If any 'permission denied' messages are displayed then the installation has failed due to insufficient permissions - run it again as Administrator.
8. Add the Oracle and Oracle bin folders to the system path environment variable:
 - a. Open **Control Panel -> System -> Advanced system settings**.
 - b. Select **Environment variables**.
 - c. Under System Variables select **'Path'**.
 - d. Select **edit**.
 - e. Insert the following at the start of the value string: **C:\oracle; C:\oracle\bin**.
 - f. Save the changes

Step 4: Configure the ODBC Data Source (OPTIONAL)

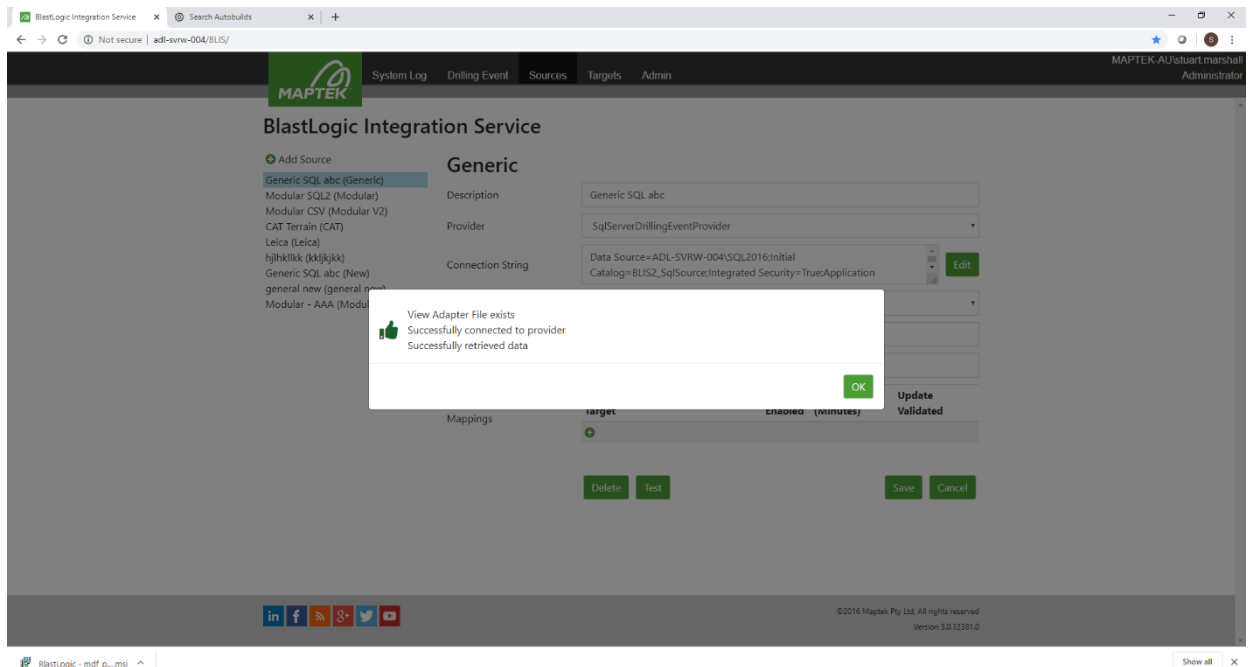
Only perform this step if an ODBC data sources are to be used.

1. Open the ODBC Data Source Administrator tool.
2. Click Add.
3. Select the appropriate ODBC driver.
4. Click Finish.
5. Configure the driver to connect to your data source.

Step 5: Configure and test Drill Navigation Sources

Grant sufficient roles for BLIS to extract data from sources. This depends on the source type and the desired authentication method.

1. In the **BLIS Administration website** open the *Sources* page.
2. Click *Add Source*.
3. Enter a *Key* (each source must have a unique key) and *Description*.
4. Select the *Provider* appropriate for your source system.
5. Enter a *Connection String* for your source system.
6. Select the appropriate *View Adapter File Name*.
7. Optionally enter the *Database view*.
8. Enter the *Look Back Hours*. BLIS will attempt to load drilling events created in this time range. The maximum is 14 hours.
9. Click *Test*.
10. You will see a popup telling you if BLIS was able to connect to your source system and extract data.

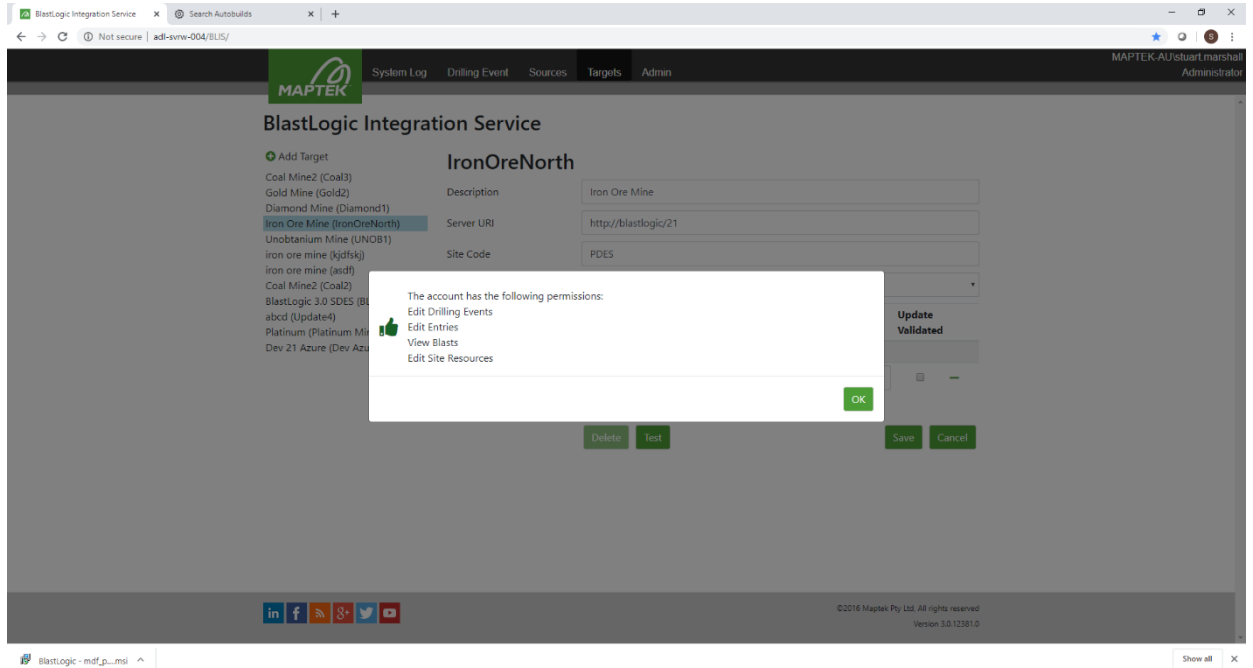


11. Click *Save*.

Step 6: Configure and test BlastLogic Targets

1. In the **BLIS Administration website** open the *Targets* page.
2. Click *Add Target*.
3. Enter a *Key* (each target must have a unique key) and *Description*.
4. Enter the *Server URI* for your Blastlogic server.

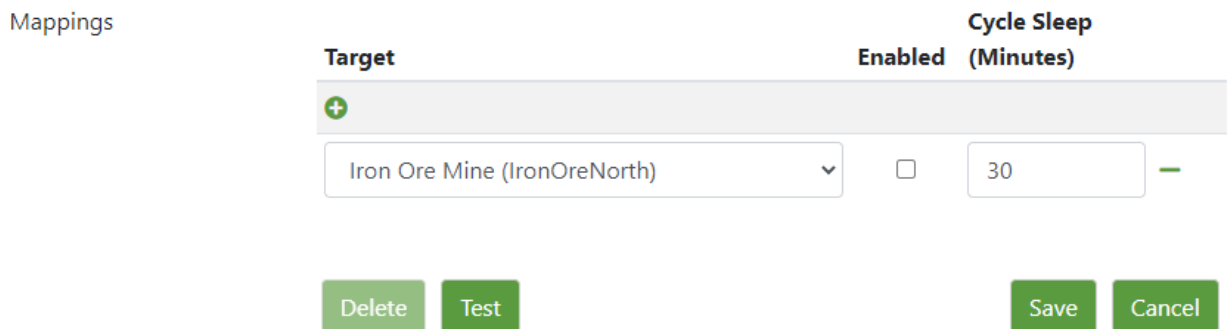
5. Enter the *Site Code* for your BlastLogic site.
6. Select the appropriate *Authentication Type*.
7. If appropriate enter the *User Name* and *Password* or *Client Id* and *Client Secret*.
8. Click *Test*.
9. You will see a popup telling you if BLIS was able to connect to your BLastLogic server and that the account has the necessary permissions to add data.



10. Click *Save*

Step 7: Map Sources to Targets

1. In the **BLIS Administration website** open the *Sources* page.
2. In the *Mappings* section click the *Add Mapping* button.
3. Select the appropriate *Target*.
4. The mapping must be *Enabled* to load data.
5. Set the *Cycle Sleep (minutes)*. BLIS will attempt to copy data from this source to this target on a cycle. The cycle repeat this many minutes apart.



6. Click *Save*.

6

Testing Requirements

Much of the functionality of the BlastLogic Integration Service is standard for an ETL¹ agent, so the same test criteria can be applied:

- Accurate – transformations alter only the representation of drilling data and do not impact its meaning or reliability.
- Complete – drilling data is captured and processed for all holes, where available in the source system. No drilling data is excluded.
- Timely – drilling data is captured and processed soon after it is available in the source system.
- Relevant – source system events that are unrelated to drilling data are not touched.

Testing carried out in the Maptek environment and customer environment will adequately address the criteria of relevance and accuracy for the source systems of sites for which a data source is provided. Tests against source data assume that the configuration and usage of a source system is the same at each site at which it is implemented. Furthermore, testing that is not performed against “live” data can only be indicative of timeliness and completeness.

TESTING SOURCE SYSTEM VIEWS

During start up the BlastLogic Integration Service will test connectivity of each configured site-based data source. Any connection failures are logged but will not prevent the service from starting. Connectivity testing can also be initiated via the Administration web site.

Testing and validation of source drilling events is planned to occur against matching design drill holes:

- Maptek integration and function testing – a data view will be required from a recent extract from each applicable customer site.
- Pre-implementation testing performed using Maptek environment
 - Data: via data views extracted from the production instance of each of the site-based source system databases.
 - Extraction method: BlastLogic’s scheduled polling of each applicable customer site data views.
- Implementation testing performed using customer environment
 - Data: as above
 - Extraction method: as above.

¹ Extract, Transform and Load. Reference: http://en.wikipedia.org/wiki/Extract,_transform,_load

To successfully test the data flow and validation within the Maptek environment, Maptek require Vulcan or other general mine planning packages .csv exported pattern and extracts of matching drill navigation data from customer sites.

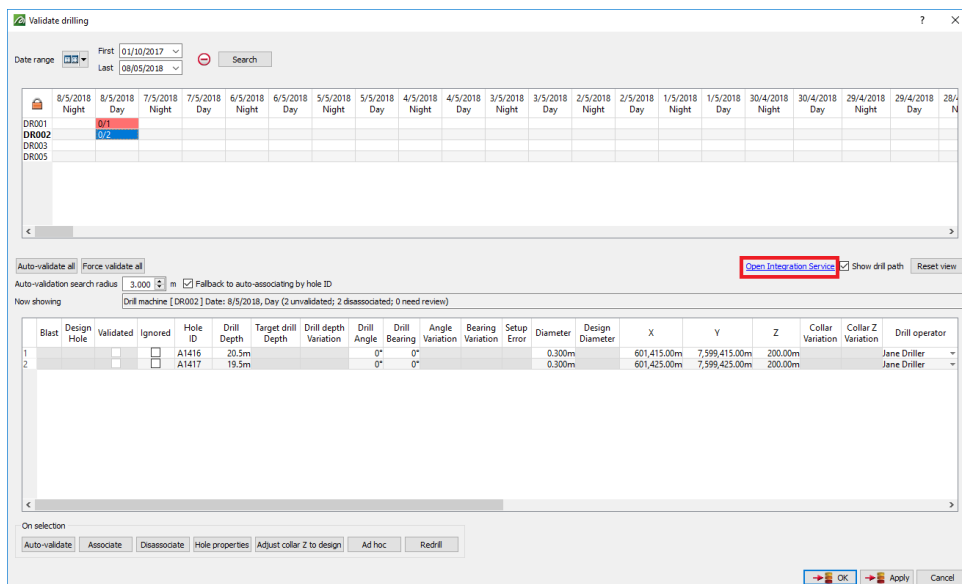
7

Operating the Service

ACCESSING THE ADMINISTRATION WEBSITE

Once the BlastLogic Integration Service has been configured, it operates in the background without requiring manual intervention under business as usual conditions.

An Administration Website is hosted by the service. It can be accessed by clicking the *Open Integration Service* link in the *Validate drilling* panel in the Desktop Client.



USING THE WEBSITE

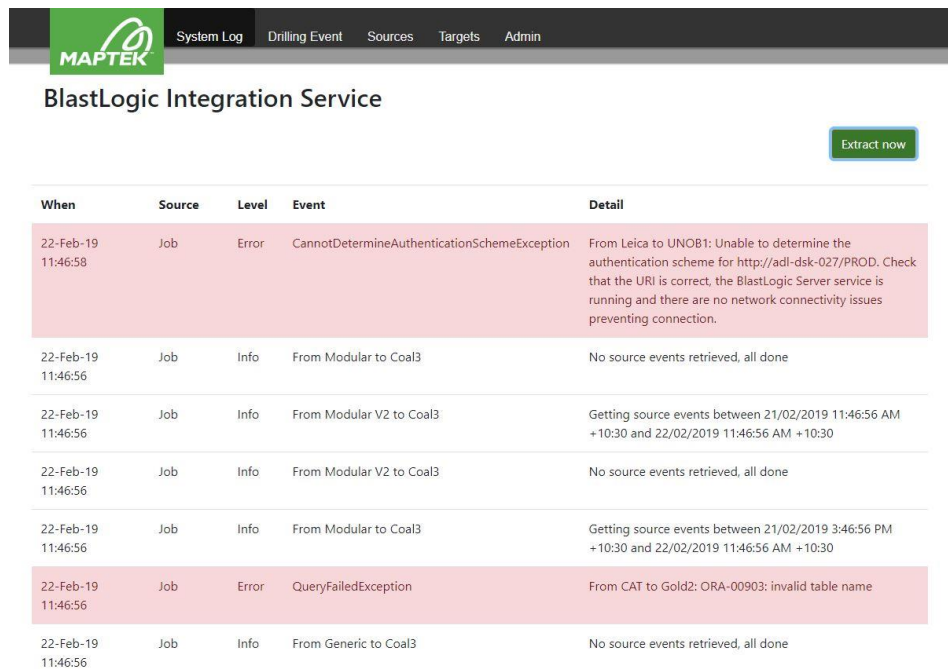
The BLIS website contains five tabs: *System Log*, *Drilling Events*, *Sources*, *Targets* and *Admin*.

System Log

The *System Log* tab provides a log of all BLIS activity. Logged activity includes:

- Which ETL process BLIS has attempted to run and when
- The number of drilling events that were loaded, updated, associated, and validated by ETL processes
- Any errors or warnings that occurred during the ETL process
- Any changes to configuration

Clicking the *Extract now* button runs causes BLIS to immediately process data from every source.



The screenshot shows the 'System Log' tab selected in the navigation bar. The page title is 'BlastLogic Integration Service'. A green 'Extract now' button is visible in the top right corner. Below the button is a table with the following columns: 'When', 'Source', 'Level', 'Event', and 'Detail'.

When	Source	Level	Event	Detail
22-Feb-19 11:46:58	Job	Error	CannotDetermineAuthenticationSchemeException	From Leica to UNOB1: Unable to determine the authentication scheme for http://adl-dsk-027/PROD. Check that the URI is correct, the BlastLogic Server service is running and there are no network connectivity issues preventing connection.
22-Feb-19 11:46:56	Job	Info	From Modular to Coal3	No source events retrieved, all done
22-Feb-19 11:46:56	Job	Info	From Modular V2 to Coal3	Getting source events between 21/02/2019 11:46:56 AM +10:30 and 22/02/2019 11:46:56 AM +10:30
22-Feb-19 11:46:56	Job	Info	From Modular V2 to Coal3	No source events retrieved, all done
22-Feb-19 11:46:56	Job	Info	From Modular to Coal3	Getting source events between 21/02/2019 3:46:56 PM +10:30 and 22/02/2019 11:46:56 AM +10:30
22-Feb-19 11:46:56	Job	Error	QueryFailedException	From CAT to Gold2: ORA-00903: invalid table name
22-Feb-19 11:46:56	Job	Info	From Generic to Coal3	No source events retrieved, all done

Drilling Event

The *Drilling Event* tab displays information about loaded drilling events.

Loaded events can be viewed for a particular target by selecting it from the *Target* drop down list.

BlastLogic Integration Service

Target:

Loaded	Id	Hole	Start time	End time	Collar X (m)	Collar Y (m)	Collar Z (m)	Depth (m)	Bearing (°)	Angle (°)	Diameter (m)	Machine	Operator	Comments	Properties
22-Feb-19 11:56:19	64675412-0BC6-4407-AB64-6221571EE839		22-Feb-19 11:47:13	22-Feb-19 11:52:13	601,450.0	7,599,330.0	200.0	19.5	0.0	0.0	0.3	DR003	Jane Driller	Some pattern	{}

Sources

A BLIS source is a source of drill data. It can be a SQL Server, Oracle or Postgres database, a CSV file or and ODBC data source. The *Sources* tab provides an interface for users to add and test sources and link them to targets.

Additional sources can be added using the *Add Source* button.

The *Test* button attempts to connect to the source database using the supplied connection string and execute the selected query files. The test succeeds if the database exists at the location specified, BLIS can login to the database, that BLIS is able to successfully execute drilling event and drill measurement query files against the database and that the returned data contains all of the mandatory fields and no duplicated fields. Any problems are reported.

Sources can contain drilling event queries or drill measurement queries or both.

BlastLogic Integration Service

+ Add Source

- Generic SQL abc (Generic)
- Modular SQL2 (Modular)
- Modular CSV (Modular V2)
- CAT Terrain (CAT)
- Leica (Leica)
- Generic SQL abc (New)
- general new (general new)
- Modular - AAA (Modular - AAA)
- Drill Measurements (DM)

Modular

Description: Modular SQL2

Provider: SqlServerDrillingEventProvider

Connection String: Data Source=ADL-SVRW-004\SQL2016;Initial Catalog=GRM_DUMMY_BAMS_Modular;Integrated Security=False;User Edit

Look Back Hours: 72

Drilling Events

Query File: Modular.sql

Database View Name:

Drill Measurements

Query File: DrillMeasurementQuery.sql

Database View Name:

Mappings

Target	Enabled	Cycle Sleep (Minutes)	Update Validated
+			
Platinum (Platinum Mine)	<input type="checkbox"/>	5	<input checked="" type="checkbox"/> -

- *Provider*: The platform of the source database.
- *Connection String*: The connection string BLIS will use to access the source database. The connection string must contain the location of the database and authentication details that BLIS will use to access the database.
- *Look Back Hours*: The period BLIS will look back for drill data. If Look Back Hours is set to 72 BLIS will attempt to retrieve any drill data that was created in the source system in the past 72 hours.
- *Drilling Events | Query File*: The SQL script that BLIS will run against the source database to extract drilling events. The query file must be located in the %ProgramData%\Maptek\BlastLogic\Integration\Drilling\[ProviderName] folder on the server that hosts BLIS.
- *Drilling Events | Database View Name*: A drilling event query file can optionally contain the placeholder [SourceView]. If it does BLIS will replace the placeholder with the value of Database View Name value. This allows multiple sources to use the same query file.
- *Drill Measurements | Query File*: The SQL script that BLIS will run against the source database to extract drill measurements. The query file must be in the %ProgramData%\Maptek\BlastLogic\Integration\Drilling\[ProviderName]\DrillMeasurementQuery folder on the server that hosts BLIS.
- *Drill Measurements | Database View Name*: A drill measurement query file can optionally contain the placeholder [SourceView]. If it does BLIS will replace the placeholder with the value of Database View Name. This allows multiple sources to use the same query file with different views.

Targets

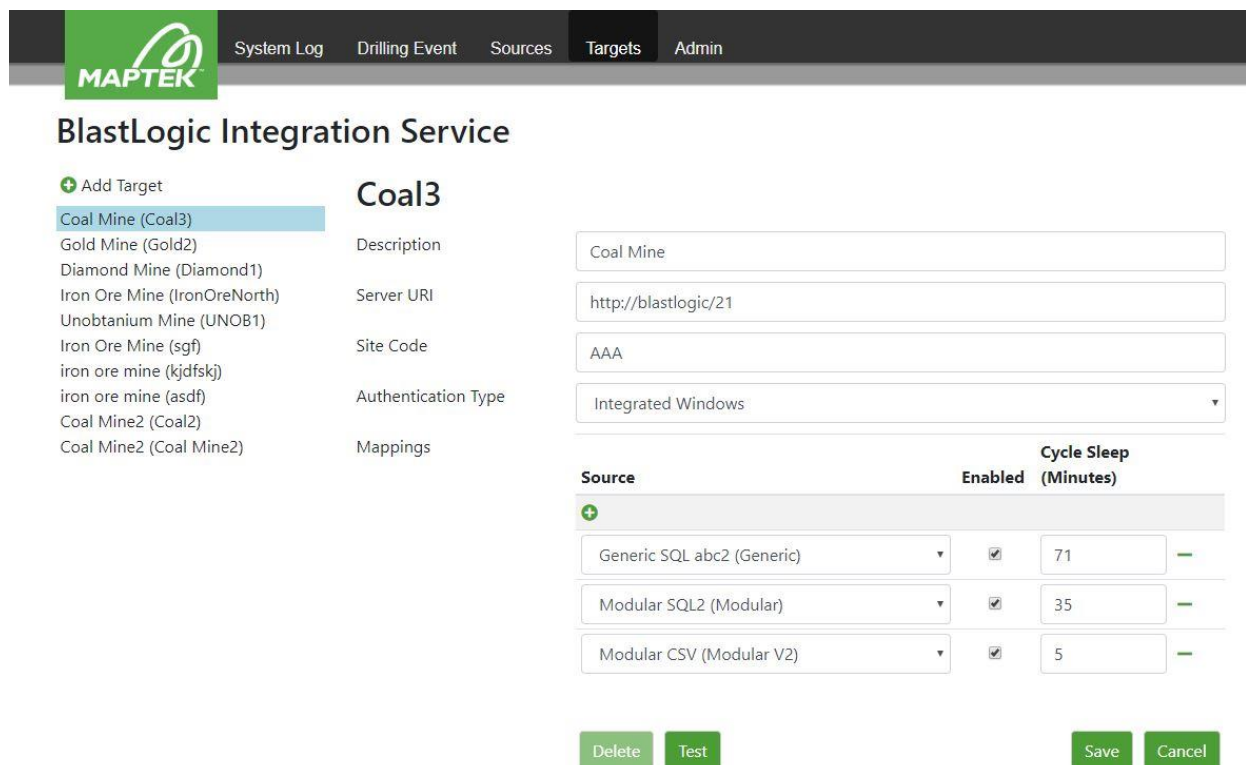
A BLIS Target is a BlastLogic site that will receive data.

The *Targets* tab provides an interface for users to add and test targets and link them to sources.

The account used to connect to BlastLogic must be a valid BlastLogic user and have the *Integration* role in the selected site.

Additional targets can be added using the *Add Target* button.

The *Test* button attempts to connect to the target server and site using the supplied credentials. The test verifies that the server exists, that is has a site with the supplied code, that the supplied credentials are valid, that the specified user is authorised to access the and has all the necessary BlastLogic permissions.



The screenshot shows the MAPTEK interface with the 'Targets' tab selected. The main heading is 'BlastLogic Integration Service'. On the left, there is a list of targets including 'Coal Mine (Coal3)', 'Gold Mine (Gold2)', 'Diamond Mine (Diamond1)', 'Iron Ore Mine (IronOreNorth)', 'Unobtainium Mine (UNOB1)', 'Iron Ore Mine (sgf)', 'iron ore mine (kjdfskj)', 'iron ore mine (asdf)', 'Coal Mine2 (Coal2)', and 'Coal Mine2 (Coal Mine2)'. The 'Coal Mine (Coal3)' target is selected.

The configuration form for 'Coal3' includes the following fields:

- Description: Coal Mine
- Server URI: http://blastlogic/21
- Site Code: AAA
- Authentication Type: Integrated Windows

Below the form is a table of sources:

Source	Enabled	Cycle Sleep (Minutes)
Generic SQL abc2 (Generic)	<input checked="" type="checkbox"/>	71
Modular SQL2 (Modular)	<input checked="" type="checkbox"/>	35
Modular CSV (Modular V2)	<input checked="" type="checkbox"/>	5

At the bottom of the form are buttons for 'Delete', 'Test', 'Save', and 'Cancel'.

- *Server URI*: The URI of the BlastLogic server.
- *Site Code*: The alphanumeric code that uniquely identifies the BlastLogic site.
- *Authentication Type*: The type of authentication that BLIS will use to access this target. *Integrated Windows* will attempt to authentication the service account that runs BLIS. *Explicit* requires the user to specify the credentials of the account used to access BlastLogic. *Azure* is used for Azure servers hosted by Maptek.
- *User Name (Explicit authentication only)*: The username that will be used to log into BlastLogic.
- *Set Password (Explicit authentication only)*: When checked the password value of password will overwrite the saved value. When not checked the saved password is maintained.
- *Password (Explicit authentication only)*: The password that will be used to log into BlastLogic.
- *Client Id (Azure authentication only)*: Similar to *User Name*.
- *Set Client Secret (Azure authentication only)*: Similar to *Set Password*.

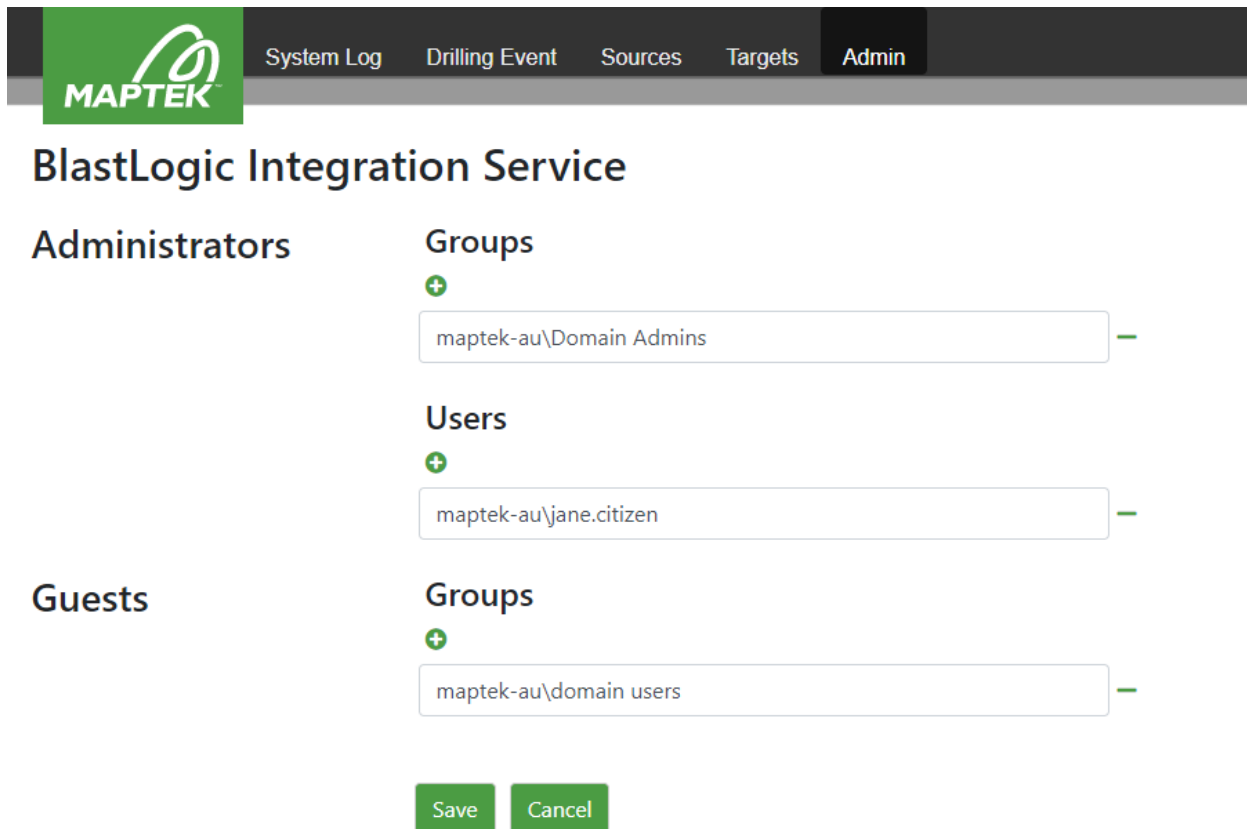
- *Client Secret (Azure authentication only):* Similar to *Password*.

Admin

The *Admin* tab controls user access to the BLIS website.

To see the BLIS website the user must be either a BLIS administrator or BLIS guest. Users who are neither an administrator nor a guest cannot access the BLIS website.

- *Administrators* have full access to every screen.
- *Guests* have read only access to *System Log*, *Drilling Events*, *Sources* and *Targets* screens.



The screenshot shows the MAPTEK Admin interface. At the top, there is a navigation bar with the MAPTEK logo and tabs for System Log, Drilling Event, Sources, Targets, and Admin. The Admin tab is selected. Below the navigation bar, the page title is "BlastLogic Integration Service". There are two main sections: "Administrators" and "Guests".

Administrators

- Groups:** A list with a green plus icon and a minus icon. The entry is "maptek-au\Domain Admins".
- Users:** A list with a green plus icon and a minus icon. The entry is "maptek-au\jane.citizen".

Guests

- Groups:** A list with a green plus icon and a minus icon. The entry is "maptek-au\domain users".

At the bottom of the interface, there are two green buttons: "Save" and "Cancel".

Administrator permissions can be granted to individual users and to groups. Guest permissions can be granted to groups.

Editing Mappings

A Mapping specifies that data from a source should be loaded into a target. Mappings can be edited in the *Mappings* section on the *Sources* tab or *Targets* tab.

- *Source:* The Source to extract data from.
- *Target:* The Target to save data in.
- *Enabled:* BLIS will only attempt to load data for a mapping that is enabled.
- *Cycle Sleep (Minutes):* Defines how frequently BLIS will attempt to load data from the source into the target. If the sleep cycle is set to 60 minutes BLIS will attempt to load data for that mapping every hour. The minimum sleep cycle is 5 minutes.

8

Setting up BLIS

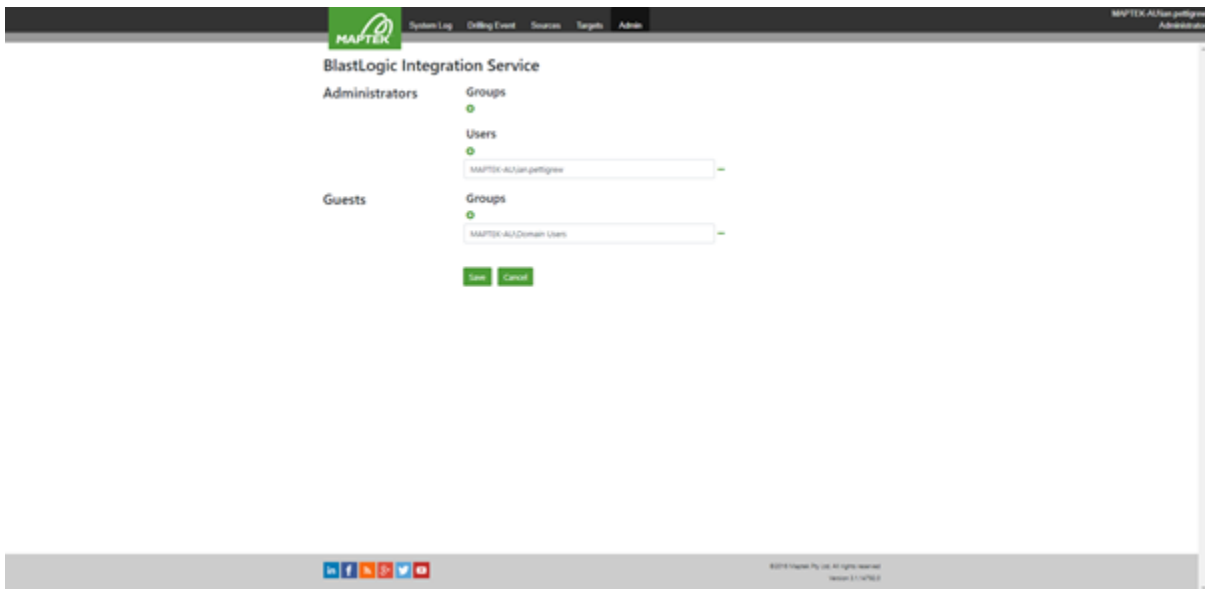
OVERVIEW

BlastLogic Integration Service (BLIS) is a server application that is used to automate the import process of drilling data into BlastLogic and subsequently validate that data. BLIS has a web interface in which we can define source data and target BlastLogic sites.

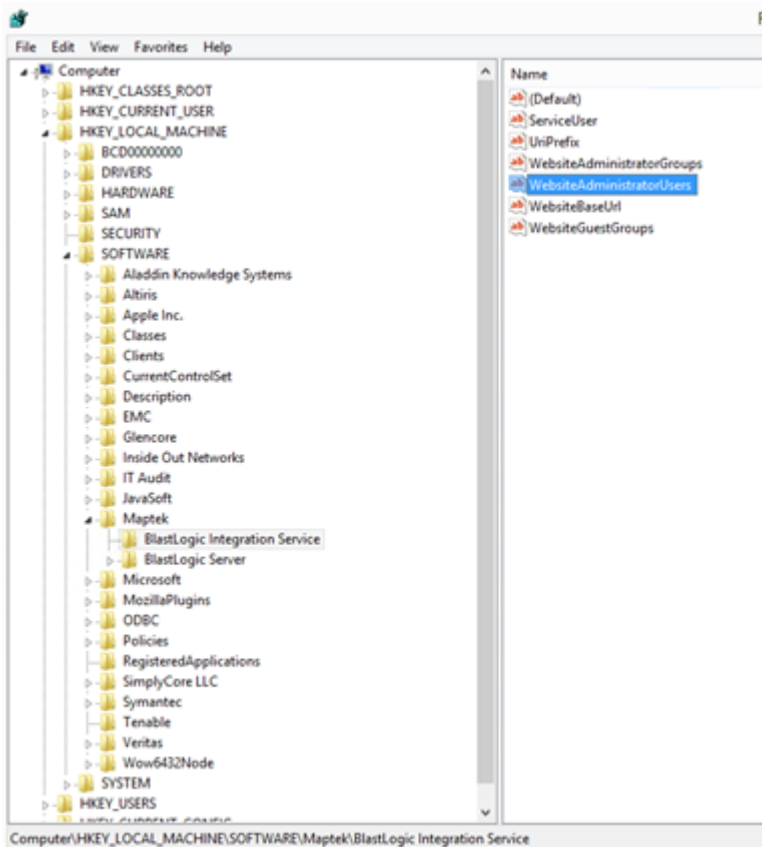


WEB ADMINISTRATOR

To use the web site to make changes to the BLIS configuration, you'll need to be listed as a website administrator.



An existing administrator can assign additional administrators via the 'Admin' tab. Alternatively, the registry can be modified via:
 [Server]\HKEY_LOCAL_MACHINE\SOFTWARE\Maptek\BlastLogic Integration Service > WebsiteAdministratorUsers



SOURCE DATA

BLIS requires access to the source data, which may require firewall permissions etc. BLIS details for [customer X] are:

- BLIS is run on server

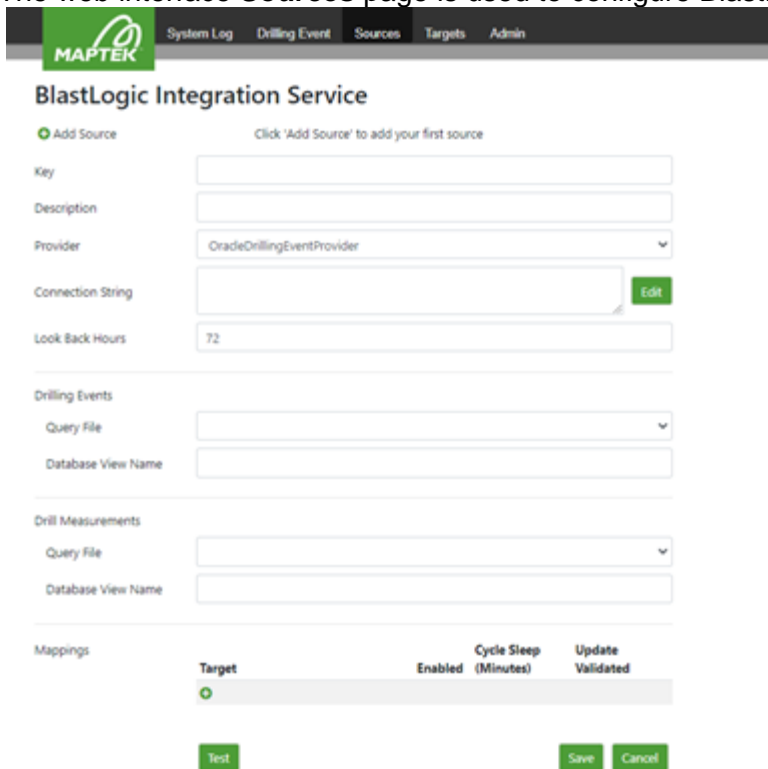
- BLIS service account

We need to provide BLIS with:

- Name of the database server
- Name of the database
- Name of the view (if appropriate)
- Source database provider platform (BLIS supports SQL Server, Postgres and Oracle)

We also need the database access credentials to authenticate the read only access on that source data. This can optionally be either integrated Windows authentication for the account that executes the BlastLogic Integration Service (BLIS), or explicitly supplied credentials.

The web interface **Sources** page is used to configure BlastLogic to read from a source:



You define the server, database and authentication method in the web interface's 'connection string' field. You can use database authentication or integrated Windows authentication:

For SQL Server connections, the format of the connection string with integrated Windows authentication is:

Data Source=[server name];Initial Catalog=[database name];Integrated Security=True

For SQL Server connections, the format of the connection string with database authentication is:

Data Source=[server name];Initial Catalog=[database name];User Id=[username];Password=[password]

Drilling event data

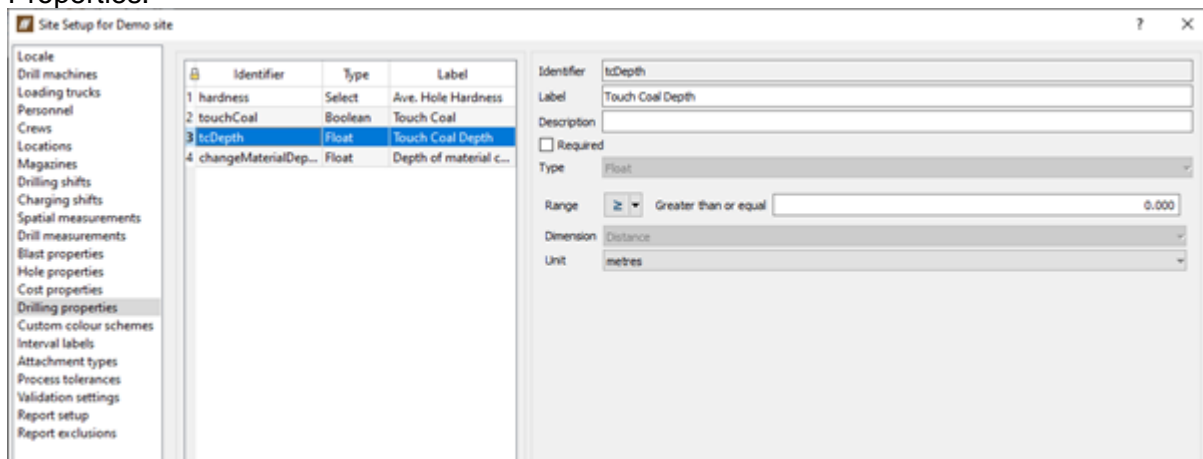
Drilling event data is typically '1 row' of information about a drill hole.

- There are 3 compulsory fields:
- Id – this needs to be a unique identifier that will not be repeated
- DrillMachine
- CompletedTime

Other default BlastLogic fields include:

- HoleName
- CollarX
- CollarY
- CollarZ
- Depth
- Diameter
- Angle
- Bearing
- Operator
- Comment
- StartTime

It's also possible to include additional information such as custom fields e.g. touch coal depth. These fields need to be set up within BlastLogic under File > Setup > Site > Drilling Properties:



Query file

The query file, (or 'adaptor file') is used to map fields from the source data to the necessary field names as recognised in BlastLogic.

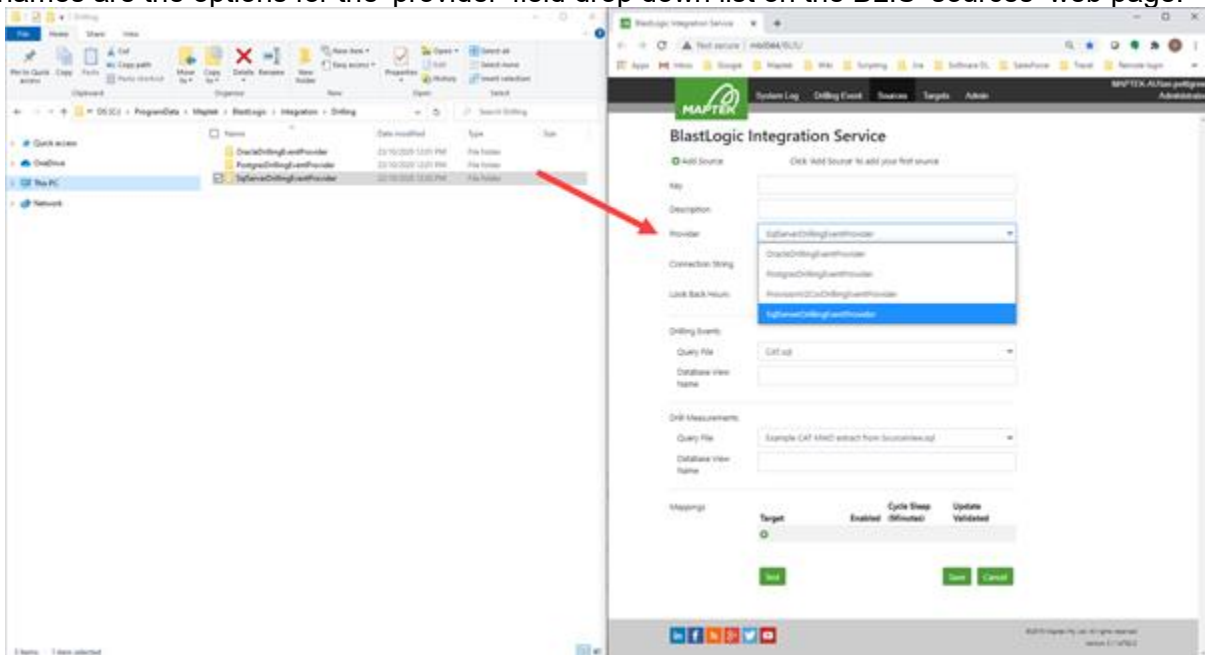
```

1 SELECT Id
2     , HOLENAME
3     , Comment
4     , CollarE as COLLARX
5     , CollarN as COLLARY
6     , CollarRL as COLLARZ
7     , Depth
8     , Diameter
9     , ANGLE
10    , BEARING
11    , DrillMachine
12    , Operator
13    , StartTime
14    , CompletedTime
15    , StringCustomProperty
16    , FloatCustomProperty
17    , BooleanCustomPropertyRequired
18    , BooleanCustomPropertyOptional
19    , SelectCustomProperty
20    , MultiSelectProperty
21    , DecimalCustomProperty
22 FROM [SourceView]
23 WHERE CompletedTime >= @StartTime AND CompletedTime < @EndTime

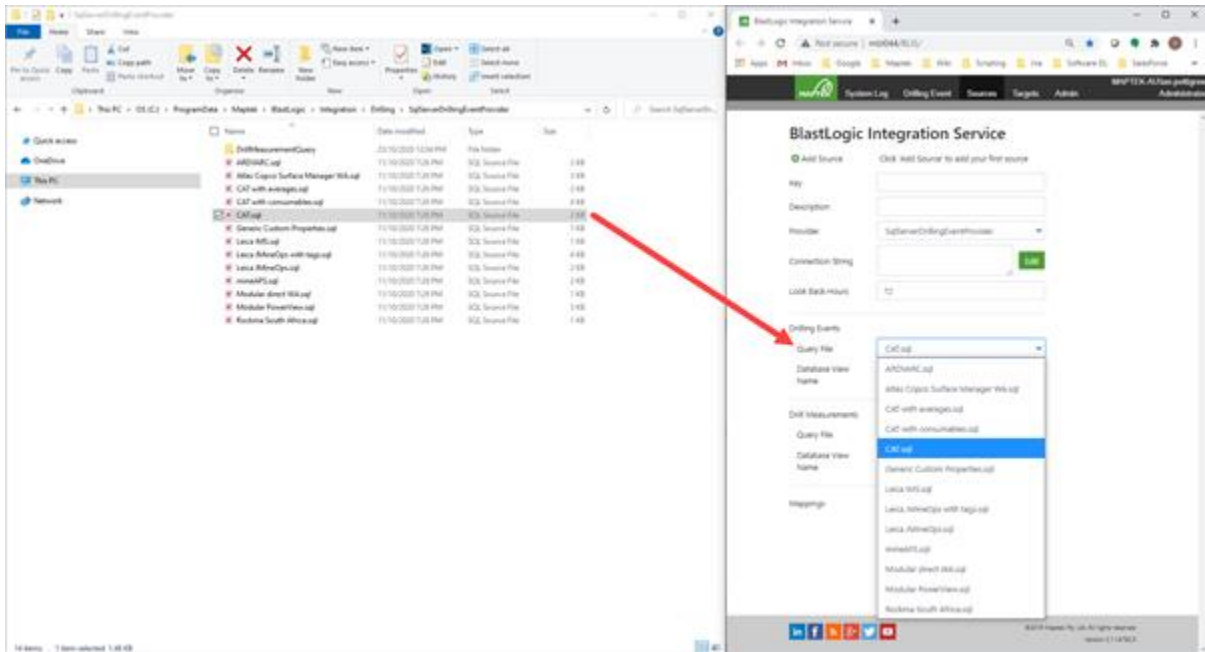
```

This file needs to be located on the BLIS server:
 %ProgramData%\Maptek\BlastLogic\Integration\Drilling\[folder name]

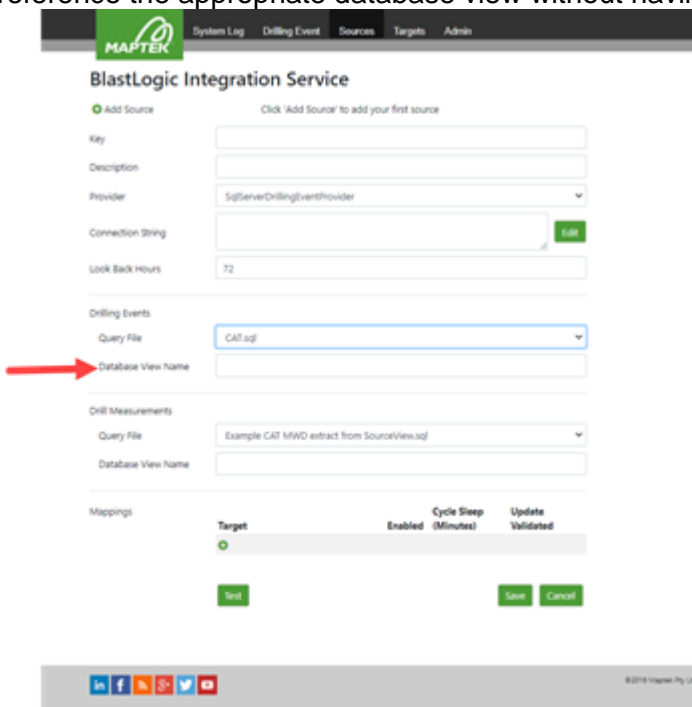
From here you have three folder options e.g. 'SqlServerDrillingEventProvider'. These folder names are the options for the 'provider' field drop down list on the BLIS 'sources' web page:



Save your query file in the appropriate directory, then you'll see the drop down list for 'query file' will now include this file name as an option:



In the query file you can directly reference the data tables or views in the database. Alternatively you can use [SourceView]; this allows you to use the web interface to reference the appropriate database view without having to modify the underlying query file:



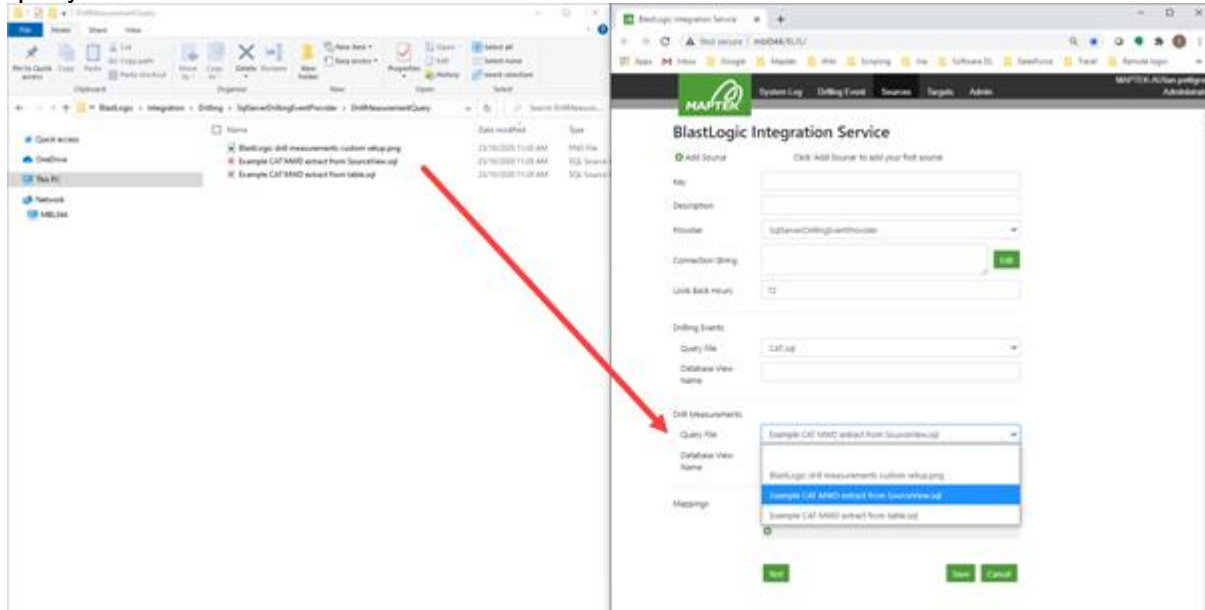
Once set up, use the 'test' button to ensure that BLIS can get a connection to the defined source data.

When you have a source set up, it is then available to be mapped to a 'target'.

MEASURE WHILE DRILLING

You can use the BLIS web site's source page to include a separate adaptor file to read in measure while drilling data. The file is to be located in a subdirectory of that same sql folder: %ProgramData%\Maptek\BlastLogic\Integration\Drilling\SqlServerDrillingEventProvider\DrillMeasurementQuery

Files located here become selectable in the web page's drop down list for 'Drill measurement query file':



In the drill measurements query file, there are Note that the 3 fields below are compulsory:

1. Id (which is required to match the 'Id' from the drilling events query file for that same hole)
2. Top
3. Bottom

All other fields are examples of optional data types. They would need to be added in BlastLogic via File > Setup > Site > Drill measurements. This example is based on a source view where most of the properties (except 'Torque') have got slightly different field names to what has been set up in BlastLogic. This is one purpose of the query file (also called an adaptor file); to map the properties together:

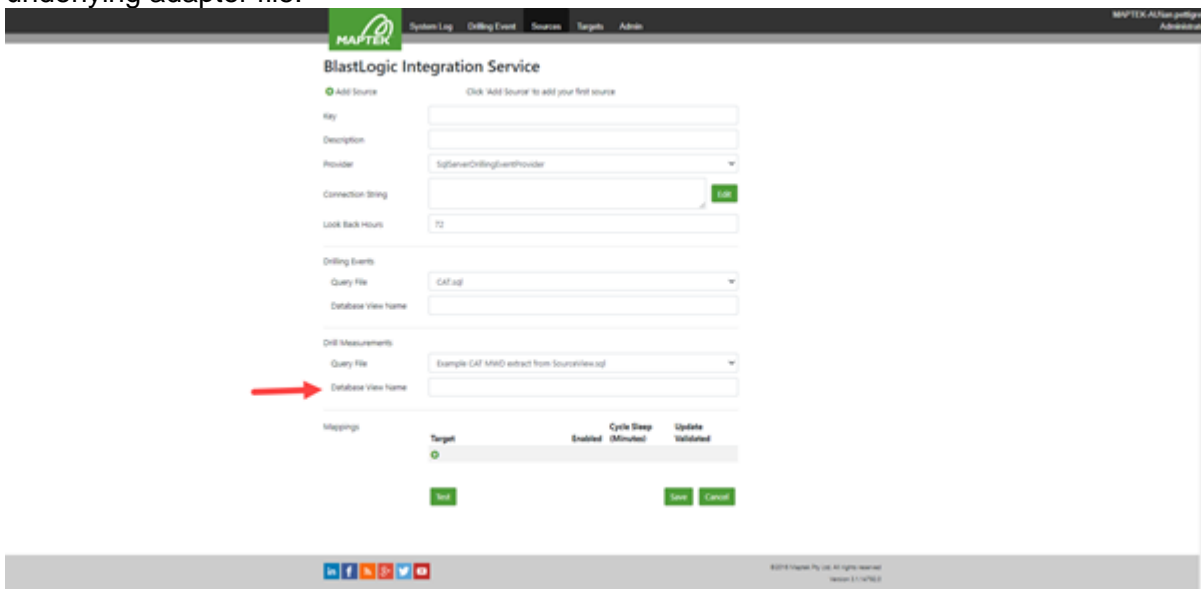
```

1 SELECT
2 [Hole_ID] as [Id],
3 [Start_Depth] as [Top],
4 [End_Depth] as [Bottom],
5 [Rpm] as [DrillRotationalSpeed],
6 [Weight_On_Bit] as [WeightOnBit],
7 [Torque],
8 [Rop] as [RateOfPenetration],
9 [Blastability] as [blastIndex],
10 [Rock_Type_ID] as [rockID]
11
12 FROM [SourceView] -- requires view to be provided in web interface
13 WHERE [Time_End] >= @StartTime AND [Time_End] < @EndTime

```

Identifier	Type	Label	Colour
1 blastindex	String	Blast index string	Orange
2 DrillRotationalSpeed	Float	Drill rotational speed	Red
3 WeightOnBit	Float	Weight on bit	Green
4 rockID	String	Rock ID string	Magenta
5 Torque	Float	Torque	Blue
6 RateOfPenetration	Float	Rate of penetration	Yellow
7 SE	Float	Specific Energy	Light Green

Also note in line 12 of the adaptor file above used '[SourceView]'. This allows us to use the web interface to reference the appropriate database view without having to modify the underlying adaptor file:



The screenshot shows the 'BlastLogic Integration Service' configuration page. Under the 'Drill Measurements' section, the 'Database View Name' field is highlighted with a red arrow. The 'Query File' field contains the text 'Example CAT MWD extract from SourceView.sql'.

It is also possible to directly query the underlying data tables in the database.

One significant benefit of using BlastLogic to collect the MWD data is to ensure data for both data sets are consistent i.e. if you were to identify a problem with the data in BlastLogic, then any modification etc will be reflected accordingly in both data sets. Once the data is in BlastLogic and drill validation has occurred, the data can be exported from BlastLogic and opened in Eureka for interpretation. From Eureka, you can use automated and assisted strata picking tools and then either directly save these interval definitions back to the holes in BlastLogic, or use them to create surfaces in Eureka and then import the surface into BlastLogic. Then, you can assign the intervals which is useful for when there are individual holes with missing or unusable drill data.