DataFlex to New Heights

Using Managed Connections

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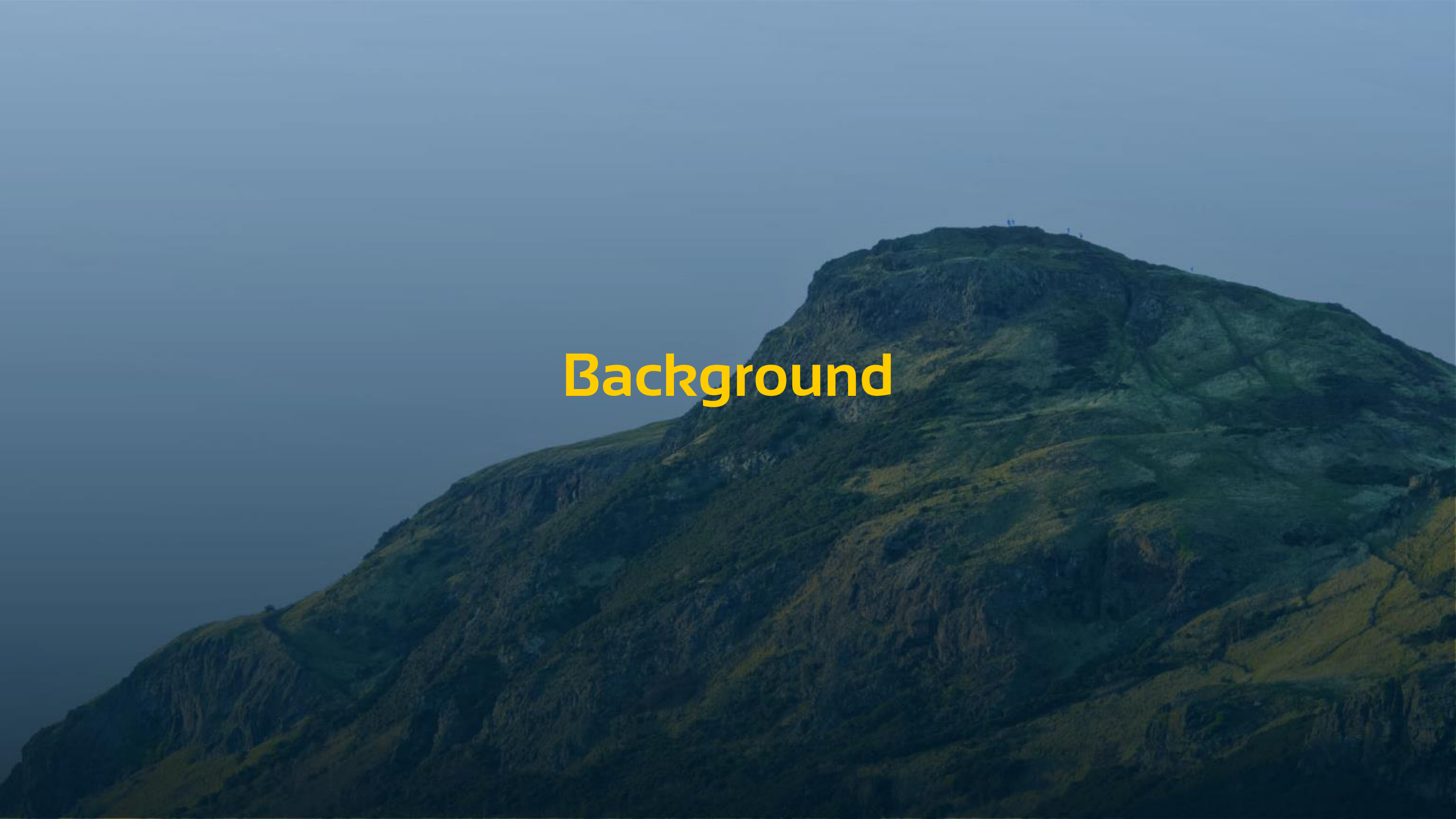
Background

The SQL Style of Accessing Data

- You connect to a server and database (connect = login)
- Using that connection, you access tables within the database
- When finished you log out of the server
- The server contains the meta-data for the database and its tables
- Portability is achieved by logging into a different server/databases that have similar tables

The DataFlex Style of Accessing Data

- A Filelist stores the locations of all tables
- Each table is opened before using it
- Tables are accessed and updated
- Upon completion tables are closed
- The meta-data for the table is stored in the table itself
- Portability is achieved via relative names in the Filelist, changing Filelists and copying files
  - Developers took great advantage of this portability

Connectivity – Bridging the Difference

- An intermediate file (INT file) is defined for each table
- The INT file contained two kinds of information
  - Server/database connection information for each table
  - Table meta-data that is not provided by the SQL Server (special column information, index information, relationship information)
- Filelist points to this INT file
- When a table is “opened”
  - It reads the INT file
  - It logs into the database server (if needed)
  - It reads the table meta-data from the database and augments this with information from the INT file
- While this worked it made it difficult to maintain portable, deployable databases (any change required changing or replacing all of the INT files)

Connection IDs

- Connection Ids were created resolve some of these limitations
- The Table's connection information was no longer stored directly in each table's INT file
- Instead it contained an ID that pointed to a server that is defined elsewhere
- Instead of changing connections in each table INT file you changed it in one central location
- The connection server information was stored either
  - in the driver INT file
  - or you wrote the code to do it yourself

A Table INT Connection Strings and IDs

A table INT file with connection string

```
DRIVER_NAME MSSQLDRV
SERVER_NAME SERVER=.\SQLEXPRESS;Trusted_Connection=yes;DATABASE=Chinook
DATABASE_NAME Album
SCHEMA_NAME dbo
```

A table INT file with a connection ID

```
DRIVER_NAME MSSQLDRV
SERVER_NAME DFCONNID=Chinook
DATABASE_NAME Album
SCHEMA_NAME dbo
```

Connection ID Limitations

- Where do you define the Connection strings?
  - The driver ini file was too global and too hard to manage
  - The “write your own code approach” was too difficult
- It still used the bottom up table open approach instead of the top down server/database access table approach
- None of our tools used it
- Developers came up with ways to work around this, but it was not easy
- Connections IDs were the right idea, they just didn't go far enough


Introducing Managed Connections

Introducing Managed Connections

- Connection information is stored at the workspace level in a configuration file
  - The solution is workspace centric
  - The file is a simple ini file
  - Normally stored in data\dfconnid.ini
- Here the full connection string and credential information is defined in dfconnid.ini

```
[connection1]
id=Chinook
driver=MSSQLDRV
connection=SERVER=.\SQLEXPRESS;DATABASE=Chinook
trusted_connection=yes
```

- The Connection ID is then used in table INT files…

```
DRIVER_NAME MSSQLDRV
SERVER_NAME DFCONNID=Chinook
DATABASE_NAME Album
SCHEMA_NAME dbo
```

- Managed Connections build on existing Connection ID concepts; think of this like “Connection IDs 2.0”

Managed Connections

- This encourages and even enforces top down access (Login on to server/database then "open" and access tables)
- A single config file can define connections to:
  - multiple servers
  - alternative servers
- Password credentials are automatically and uniquely encrypted in the connection file
- It can be used with embedded SQL
- If provides the basis for switching connections dynamically
- It's very extendable
- It's remarkably backwards compatible

Studio and Managed Connections

- We provide high level tools to configure manage the entire process
  - The Studio, tools and Wizards allow you to add and manage the connections
  - It’s easy to create tables using managed connections
    - It’s also easy to switch existing SQL table definitions to use managed connections
  - You will see these tools in action

Applications and Managed Connections

The access logic is code based

- Access to this configuration file is handled through a single cConnection object
- Your applications and our tools, use the same cConnection API
- It requires very little code to implement in your application

Code required to support managed connections in application

```
Object oApplication is a cApplication

    Object oConnection is a cConnection
        Use LoginEncryption.pkg
        Use DatabaseLoginDialog.dg
    End_Object

End_Object
```

cConnection Class

- Managed connections are implemented via the cConnection class.
- The cConnection class will handle all connections for DataFlex CLI drivers (6.2 and higher)
- cConnection is a class that creates a single, global object that allows you to
  - Create and maintain Connection IDs
  - Use Connection IDs in your table INT files
  - Define connections IDs in a workspace connections .ini file
  - Login to database servers via Connection IDs
  - Make ESQL connections to servers via Connection IDs

Using Managed Connections

- Let’s see this in action…


Supporting Additional Connections

Supporting Additional Connections

- You can define more than one connection in the connections .ini file
  - Alternate connections
  - Multiple connections
- Alternate connections are defined when you wish to run an application using an alternate server
  - The IDs will be the same but only one will be enabled
- Multiple connections are defined when your application needs to open tables from multiple servers
  - Each server will have it's own ID
- Let's see this in action…

A Connection with Alternate Connections

```
[connection1]
Id=ID1
driver=MSSQLDRV
connection=SERVER=.\SQLEXPRESS;DATABASE=Order
trusted_connection=yes
disabled=yes
[connection2]
Id=ID1
driver=MSSQLDRV
connection=SERVER=.\SQLEXPRESS;DATABASE=Order_Demo
trusted_connection=yes
```

A Connection with Multiple Connections

```
[connection1]
Id=ID1
driver=MSSQLDRV
connection=SERVER=.\SQLEXPRESS;DATABASE=Order
trusted_connection=yes
[connection2]
Id=RS1
driver=MSSQLDRV
connection=SERVER=MyRemoteServer;DATABASE=RemoteData
UID=AppUser
PWD=893753hskfgd
```


Encryption and Database Logins

Encryption and Database Logins

- An application needs to login into a database server.
  - Usually this occurs when the application is started
  - is required – if login fails, the application should not be run
  - is silent - it does not require user interaction
  - uses credential information stored with the application's configuration data (dfconnid.ini file)
  - The stored credential information must be secure
  - Note: this is not a user login - this occurs *before* a user login
- Managed Connections handles all of this

Storing Login Credentials

- Storing encrypted passwords creates some challenges
  - This must be supported both for your applications and in our tools
    - The Application encryption method should be fully customizable and only known by the developer
    - The Tool encryption method is controlled and only known by us

- We solve this by storing two password encryptions
  - PWD – this stores the application password encrypted using a method known only to the application developer
  - DFPWD – this stores our Studio (and tools) password encrypted using a method know only to us

The Connections .ini File

A connection with user id / password information

```
[connection1]
id=Chinook
driver=MSSQLDRV
connection=SERVER=.\SQLEXPRESS;DATABASE=Chinook
UID=AppUser
PWD=8973753hskfjd
DFPWD=sdfj876jdk
```

The Database Login Tool

- A tool is required to configure the credential information.
- That tool is a database login dialog that
  - is only invoked when needed
  - accepts input to perform the login
  - stores the successful credentials
  - uses the applications encryptions rules to store passwords
- We provide you that tool
  - It uses a workspace unique random key to seed the encryption and it can be further customized by the developer
  - can be embedded in your windows application or used standalone
- Our applications (Studio, etc.) uses a similar tool and technique

Encryption and Login Object Packages

- Your application contains code in two object packages that manage encryption and logging in. The standard packages are

```
Object oApplication is a cApplication

    Object oConnection is a cConnection
        Use LoginEncryption.pkg
        Use DatabaseLoginDialog.dg
    End_Object

End_Object
```

- You can replace these with your own custom packages using ours as your template.


Dynamic Connections

Dynamic connections

- cConnection makes it possible to change database servers and databases dynamically
- Applications can select their connection upon startup
- Applications can change their database within a server, while running
  - DF_DATABASE_DEFAULT_DATABASE
- Applications can redirect their server/database connections at runtime
  - RedirectConnectionID
- Paves the way for multi-tenant applications
- This will be particularly useful for web applications

Summary

Managed Connections Summary

- It's a better fit with SQL client-server databases
- It makes your applications behave more sensibly
- During development it’s easy to work with multiple copies of databases
- It makes it easier to deploy to database servers - only one file changes
- It makes it easier to exchange workspaces with SQL data
- A single config file can define connections to *multiple* servers
- A single config file can define connections to *alternative* servers
- Password credentials are automatically and uniquely encrypted in the connection file
- It can be used with embedded SQL
- It's very extendable
- Adding code to existing applications to use managed connections is really easy


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Thank you!
Are there any questions?