

1. Main page: <http://cortanaanalytics.com>
2. To begin this module, you should have:
  1. Basic Math and Stats skills
  2. Business and Domain Awareness
  3. General Computing Background

NOTE: These workbooks contain many resources to lead you through the course, and provide a rich set of references that you can use to learn much more about these topics. If the links do not resolve properly, type the link address in manually in your web browser. If the links have changed or been removed, simply enter the title of the link in a web search engine to find the new location or a corollary reference.

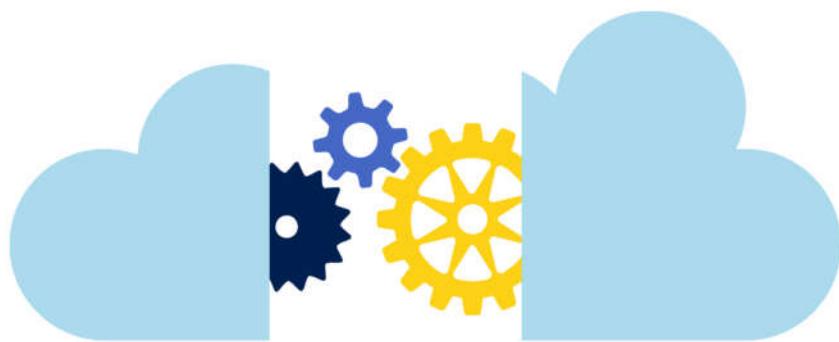
# Section 3 Learning Objectives

1. Understand ADF and its constructs
2. Implement an ADF Pipeline referencing Data Sources and with various Activities
3. Understand how HDInsight can be used to process data
4. Understand the HIVE language and how it is used

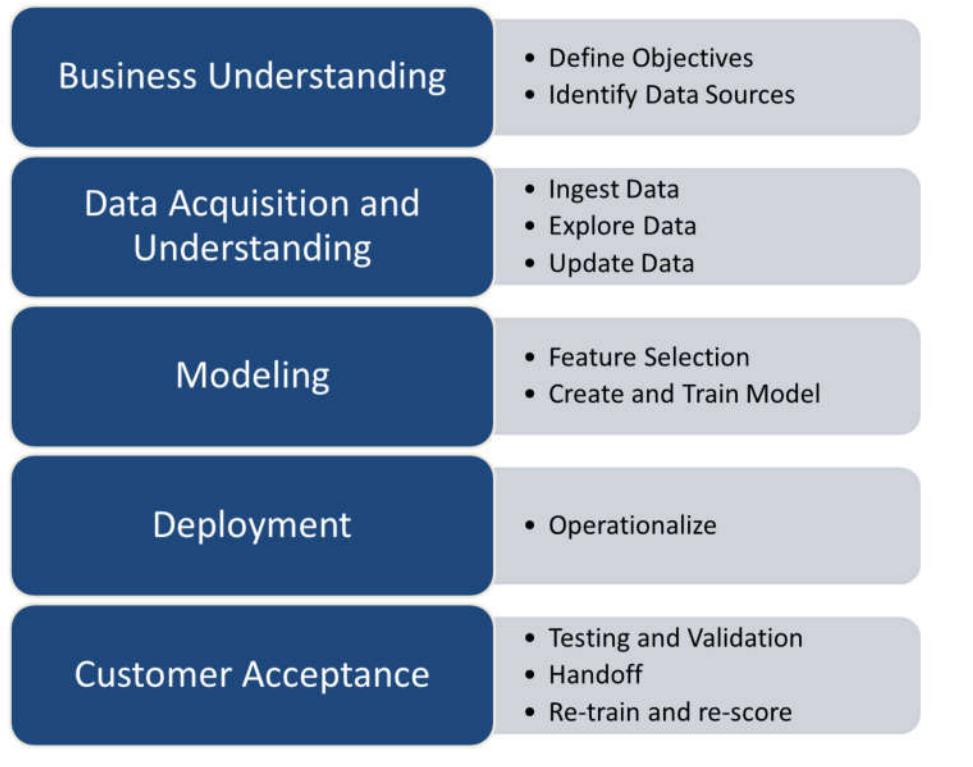


1. At the end of this Module, you will:
  1. Understand ADF and its constructs
  2. Implement an ADF Pipeline referencing Data Sources and with various Activities
  3. Understand how HDInsight can be used to process data
  4. Understand the HIVE language and how it is used

# The Data Science Process and Platform



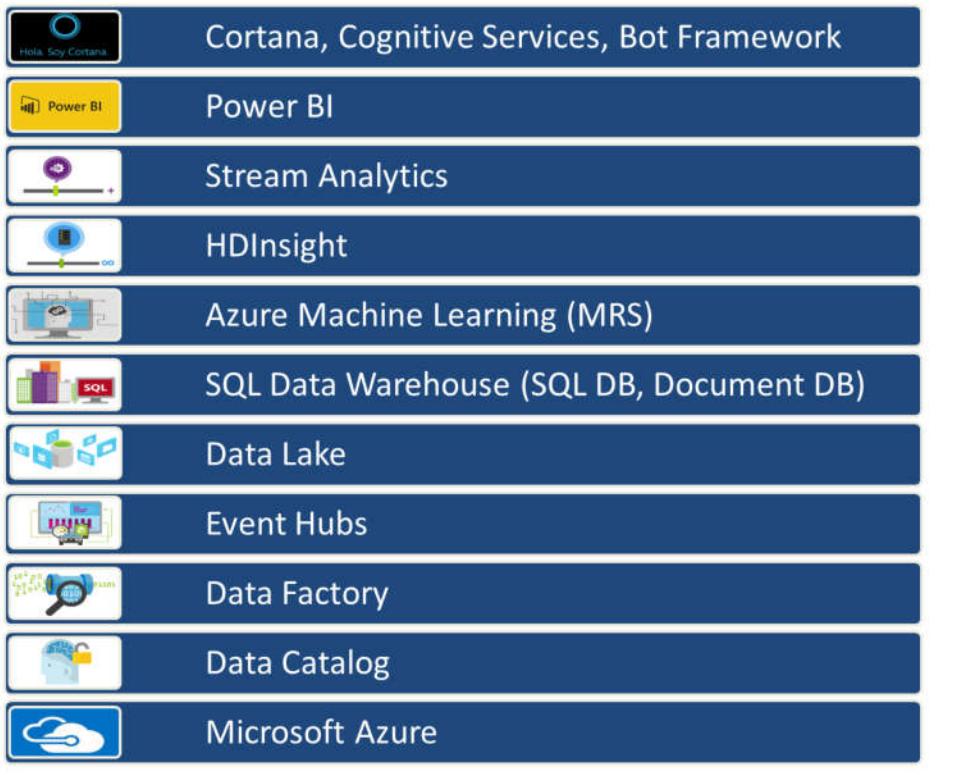
# The Team Data Science Process



1. This process largely follows the CRISP-DM model:  
<http://www.sv-europe.com/crisp-dm-methodology/>
2. It also references the Cortana Intelligence process:  
<https://azure.microsoft.com/en-us/documentation/articles/data-science-process-overview/>
3. A complete process diagram is here:  
<https://azure.microsoft.com/en-us/documentation/learning-paths/cortana-analytics-process/>
4. Some walkthrough's of the various services:  
<https://azure.microsoft.com/en-us/documentation/articles/data-science-process-walkthroughs/>
5. An integrated process and toolset allows for a more close-to-intent deployment

6. Iterations are required to close in on the solution – but are harder to management and monitor
7. GitHub site with project structure, guidance and utilities to get a team started:  
<https://github.com/Azure/Microsoft-TDSP>

# The Cortana Intelligence Platform



1. Platform and Storage: Microsoft Azure – <http://microsoftazure.com> Storage: <https://azure.microsoft.com/en-us/documentation/services/storage/> (Host It)
2. Azure Data Catalog: <http://azure.microsoft.com/en-us/services/data-catalog> (Doc It)
3. Azure Data Factory: <http://azure.microsoft.com/en-us/services/data-factory/> (Move It)
4. Azure Event Hubs: <http://azure.microsoft.com/en-us/services/event-hubs/> (Bring It)
5. Azure Data Lake: <http://azure.microsoft.com/en-us/campaigns/data-lake/> (Store It)
6. Azure DocumentDB: <https://azure.microsoft.com/en-us/services/documentdb/>, Azure SQL Data Warehouse: <http://azure.microsoft.com/en-us/services/sql-data-warehouse/> (Relate It)
7. Azure Machine Learning: <http://azure.microsoft.com/en-us/services/machine-learning/> (Learn It)
8. Azure HDInsight: <http://azure.microsoft.com/en-us/services/hdinsight/> (Scale It)
9. Azure Stream Analytics: <http://azure.microsoft.com/en-us/services/stream-analytics/> (Stream It)
10. Power BI: <https://powerbi.microsoft.com/> (See It)
11. Cortana: <http://blogs.windows.com/buildingapps/2014/09/23/cortana-integration-and-speech-recognition-new-code-samples/> and <https://blogs.windows.com/buildingapps/2015/08/25/using-cortana-to-interact-with-your-customers-10-by-10/> and <https://developer.microsoft.com/en-us/Cortana> (Say It)
12. Cognitive Services: <https://www.microsoft.com/cognitive-services>
13. Bot Framework: <https://dev.botframework.com/>
14. All of the components within the suite: <https://www.microsoft.com/en-us/server-cloud/cortana-intelligence-suite/what-is-cortana-intelligence.aspx>
15. What can I do with it? <https://gallery.cortanaintelligence.com/>

16. Getting Started Quickly: <https://caqs.azure.net/#gallery>

## Module 1: Data Selection, Processing and Transformation



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1. Depends on the customer -  
<https://www.microsoft.com/en-us/cloud-platform/cortana-intelligence-suite-industry-solutions>

# Business Case

AdventureWorks is a company that makes and sells bicycles. The sales are conducted around the world. We also support our products. But as we've made more sales in the last 10 years, we've farmed out the support function to various companies that take in maintenance and support issues in call centers around the world.

We're growing. And now we want to take our bicycles to several large retailers, but a few of them want to know a lot about our churn rate.

For over 10 years, we've collected a lot of information about our customers and of course we know a lot about our products. But since we've outsourced our call centers, we don't own the databases that hold their data – they will give us an export, though. (They support multiple customers)

We're not sure about our churn rate – we have the data of who has and has not bought again, and we think we can get the data from the call centers for the complaints and repairs, but we need a way to analyze a lot of data that has different formats to find a prediction of who will churn and who will not.

Ideally we want a list of customers we think will churn, in a structured database we could share out to our potential resellers sales staff, so they know how to target at-risk and new clients.



More on our in-house data: <https://technet.microsoft.com/en-us/library/ms124501%28v=sql.100%29.aspx>

1. AdventureWorks Data Dictionary:  
[https://technet.microsoft.com/en-us/library/ms124438\(v=sql.100\).aspx](https://technet.microsoft.com/en-us/library/ms124438(v=sql.100).aspx)

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## Module 2: HDInsight for Data Manipulation and Processing



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1. Processing, querying, and transforming data using HDInsight: <https://msdn.microsoft.com/en-us/library/dn749822.aspx>

# Hadoop and HDInsight



Hortonworks Powers  
**Microsoft HDInsight**



## Using the Hadoop Ecosystem to process and query data

1. Primary site: <https://azure.microsoft.com/en-us/services/hdinsight/>
2. Quick overview: <https://azure.microsoft.com/en-us/documentation/articles/hdinsight-hadoop-introduction/>
3. 4-week online course through the edX platform:  
<https://www.edx.org/course/processing-big-data-azure-hdinsight-microsoft-dat202-1x>
4. 11 minute introductory video: <https://channel9.msdn.com/Series/Getting-started-with-Windows-Azure-HDInsight-Service/Introduction-To-Windows-Azure-HDInsight-Service>
5. Microsoft Virtual Academy Training (4 hours) - [https://mva.microsoft.com/en-US/training-courses/big-data-analytics-with-hdinsight-hadoop-on-azure-10551?l=UJ7MAv97\\_5804984382](https://mva.microsoft.com/en-US/training-courses/big-data-analytics-with-hdinsight-hadoop-on-azure-10551?l=UJ7MAv97_5804984382)
6. Learning path for HDInsight: <https://azure.microsoft.com/en-us/documentation/learning-paths/hdinsight-self-guided-hadoop-training/>
7. Azure Feature Pack for SQL Server 2016, i.e., SSIS (SQL Server Integration Services): [https://msdn.microsoft.com/en-us/library/mt146770\(v=sql.130\).aspx](https://msdn.microsoft.com/en-us/library/mt146770(v=sql.130).aspx)

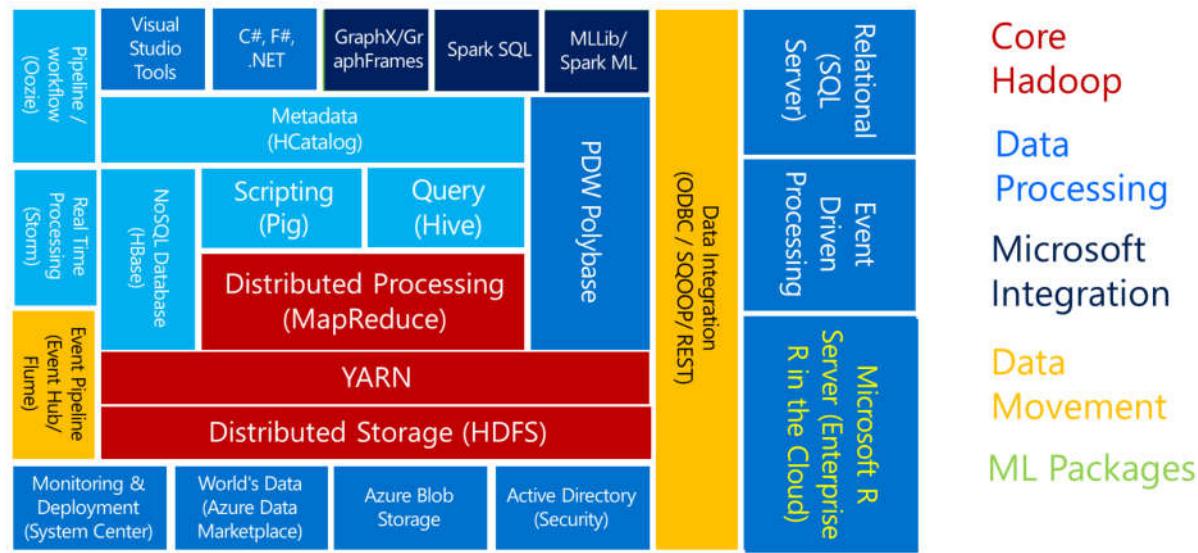
# Hadoop



- An ecosystem of components for distributed data processing and analysis
- Core components: MapReduce, HDFS, YARN
- Data is processed in the Hadoop Distributed File System (HDFS)
- Resource Management is performed by YARN
- Many other related projects

1. Introduction Document: <https://azure.microsoft.com/en-us/documentation/articles/hdinsight-hadoop-introduction/>
2. For more information about Hadoop, visit the apache foundation site: <http://hadoop.apache.org/>

# HDInsight and the Hadoop Zoo Ecosystem



- Full training example for the local HDP Instance: <http://hortonworks.com/hadoop-tutorial/hello-world-an-introduction-to-hadoop-hcatalog-hive-and-pig/>
- More detail on the Hadoop Components: <http://www.datasciencecentral.com/profiles/blogs/hadoop-herd-when-to-use-what>
  - Hcatalog – exposes hive metadata to other applications, giving users a relational view of HDFS data
  - Hbase - A non-relational (NoSQL) database that runs on top of HDFS, random-realtime reads of HDFS data
  - Polybase - PolyBase is a technology that accesses and combines both non-relational and relational data, all from within SQL Server. It allows you to run queries on external data in Hadoop or Azure blob storage. The queries are optimized to push computation to Hadoop
    - <https://msdn.microsoft.com/en-us/library/mt143171.aspx>

# HDInsight



- 7 Cluster types
- Storage layer: Azure Storage or Azure Data Lake provides the HDFS
- Azure SQL Database stores metadata



1. Main page: <https://azure.microsoft.com/en-us/documentation/services/hdinsight/>
2. Pricing for HDInsight: <https://azure.microsoft.com/en-us/pricing/details/hdinsight/>
3. On demand HDInsight cluster:  
<https://azure.microsoft.com/en-us/documentation/articles/data-factory-compute-linked-services/#azure-hdinsight-on-demand-linked-service>

# Deploying HDInsight Clusters

- Cluster Type: Hadoop, Spark, R Server, HBase, Kafka, Storm, Hive LLAP
- Operating System: Linux
  - Windows support to be deprecated by second half of 2017
  - No more new deployments for Windows based clusters
  - No more resizing of Windows clusters
  - Migrate to Linux, ASAP! See [here](#) for migration information.
- Can be deployed from Azure portal, ARM Templates, Azure Command Line Interface (CLI), or Azure PowerShell
- Cluster Management through Ambari UI and REST API
- Remote Access through SSH, REST API, ODBC, JDBC.
- Premium Features: Secure Hadoop and Apache Ranger for Multi-User Administration

1. Azure Portal: <http://azure.portal.com>
2. Provisioning Clusters: <https://azure.microsoft.com/en-us/documentation/articles/hdinsight-provision-clusters/>
3. Different clusters have different node types, number of nodes, and node sizes.

# Using Hive to Query Data

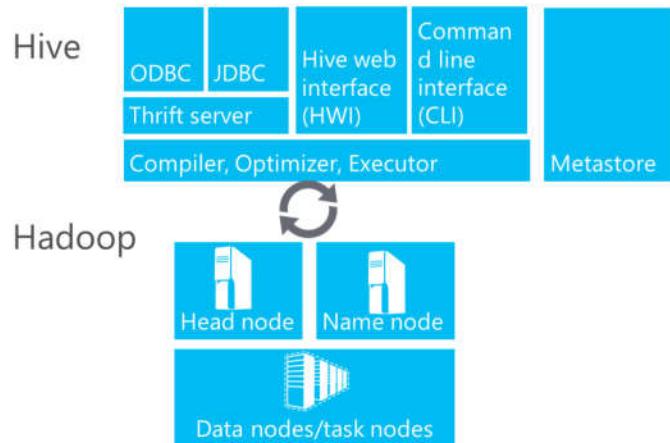
- Hive is a higher-level abstraction of MapReduce.
- It provides a structure for highly unstructured data by delivering metadata service that projects tabular schemas over folders.
- Enables the contents of folders to be queried as though they were tables.
- It provides a SQL-like query semantics that are translated into Tez or MapReduce jobs (no need to write Java or MapReduce!).
- Not a relational database.
- Persistent data through Azure Blob Storage or ADL



- Hive for HDInsight: <https://azure.microsoft.com/en-us/documentation/articles/hdinsight-use-hive/>
- Referencing user defined functions with Hive: <https://msdn.microsoft.com/en-us/library/dn749875.aspx?f=255&MSPPError=-2147217396>
- Using Apache Tez for improved performance: <https://azure.microsoft.com/en-us/documentation/articles/hdinsight-use-hive/#usetez>

# Hive architecture

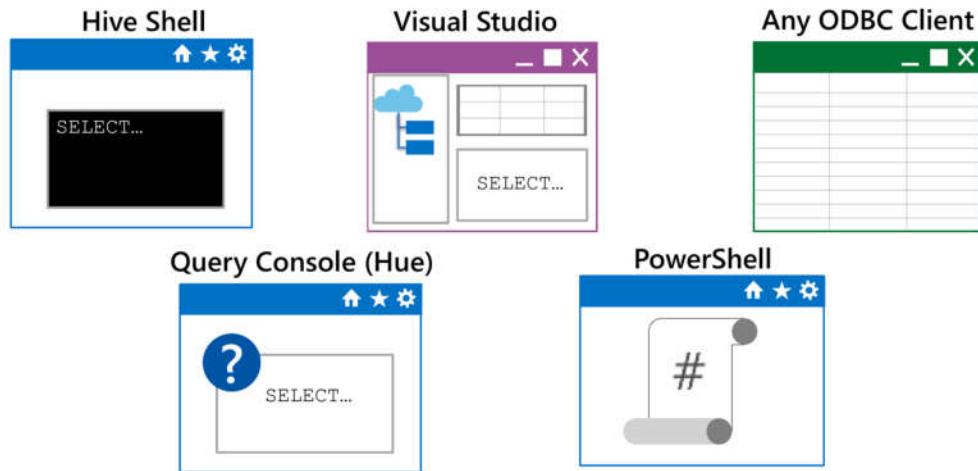
- Built on top of Hadoop to provide data management, querying, and analysis
- Access and query data through simple SQL-like statements, called Hive queries
- In short, Hive compiles, Hadoop executes



1. Hive for HDInsight: <https://azure.microsoft.com/en-us/documentation/articles/hdinsight-use-hive/>
2. Referencing user defined functions with Hive: <https://msdn.microsoft.com/en-us/library/dn749875.aspx?f=255&MSPPError=-2147217396>
3. Using Apache Tez for improved performance: <https://azure.microsoft.com/en-us/documentation/articles/hdinsight-use-hive/#usetez>

## Hive Client Tools

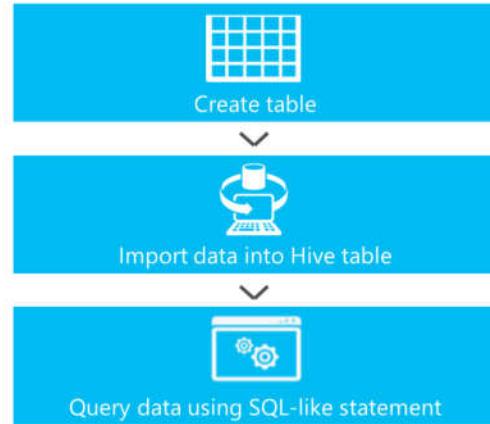
- You can submit Hive Jobs using many different tools



1. <https://azure.microsoft.com/en-us/documentation/articles/hdinsight-connect-excel-hive-odbc-driver/>

# Create, load, and query Hive tables

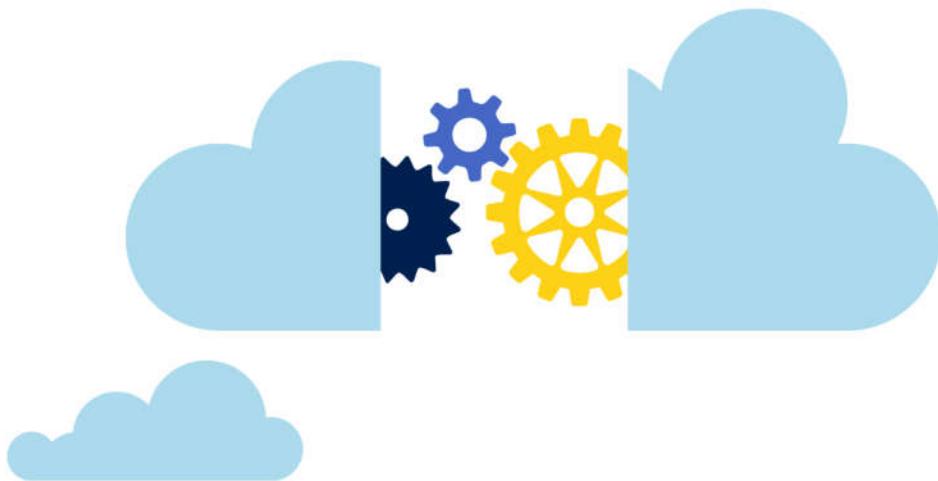
HiveQL includes data definition language, data import/export and data manipulation language statements



1. Full tutorial on creating Hive Tables:

<https://www.dezyre.com/hadoop-tutorial/apache-hive-tutorial-tables>

## Module 3: Azure Data Factory



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1. Primary Site: <https://azure.microsoft.com/en-us/services/data-factory/>
2. 2-minute overview video:  
<https://channel9.msdn.com/Blogs/Windows-Azure/Introduction-to-Azure-Data-Factory/>

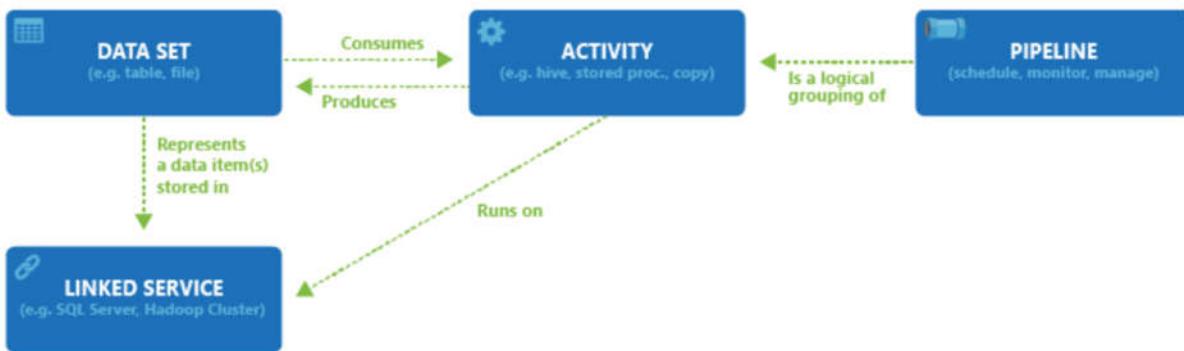
# Azure Data Factory



Create, orchestrate, and manage  
data movement and enrichment  
through the cloud

1. Learning Path: <https://azure.microsoft.com/en-us/documentation/articles/data-factory-introduction/>
2. Developer Reference: <https://msdn.microsoft.com/en-us/library/azure/dn834987.aspx>

# ADF Components



1. Pricing: <https://azure.microsoft.com/en-us/pricing/details/data-factory/>

# ADF Logical Flow

Overview diagram



1. Learning Path: <https://azure.microsoft.com/en-us/documentation/articles/data-factory-introduction/>
2. Quick Example:  
<http://azure.microsoft.com/blog/2015/04/24/azure-data-factory-update-simplified-sample-deployment/>

## ADF Process

1. Define Architecture: Set up objectives and flow
2. Create the Data Factory: Portal, PowerShell, VS
3. Create Linked Services: Connections to Data and Services
4. Create Datasets: Input and Output
5. Create Pipeline: Define Activities
6. Monitor and Manage: Portal or PowerShell, Alerts and Metrics

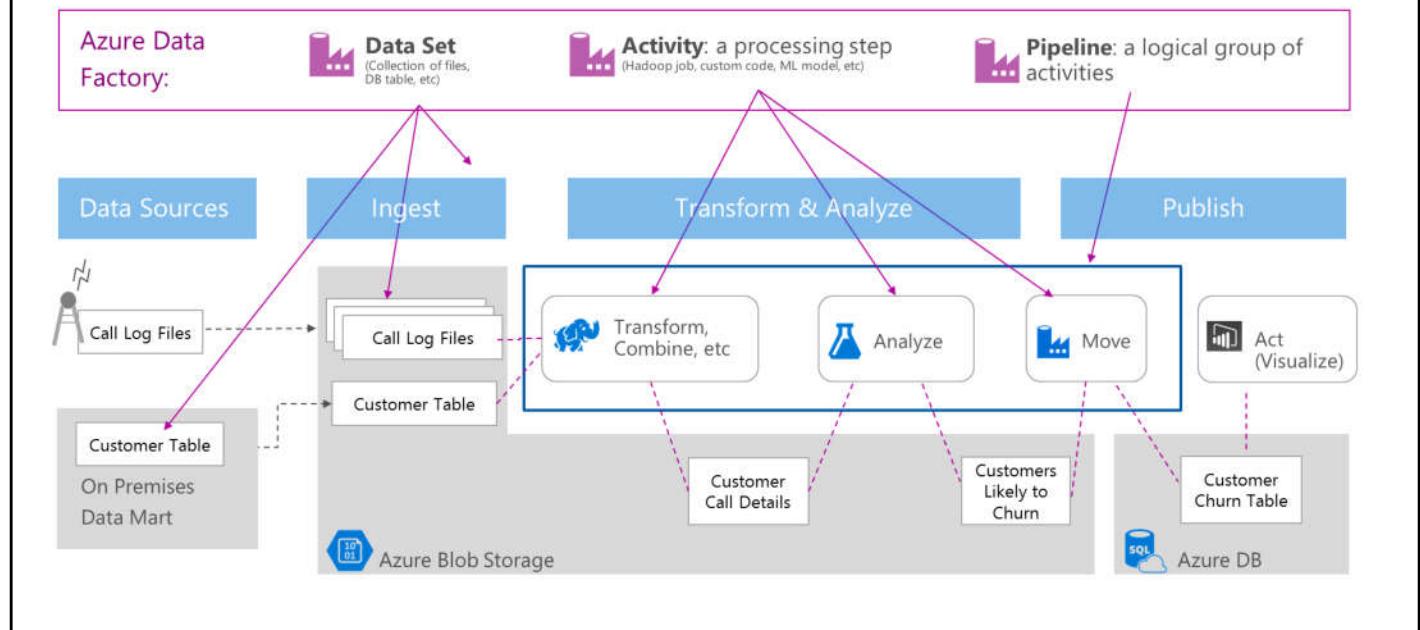
1. Full Tutorial: <https://azure.microsoft.com/en-us/documentation/articles/data-factory-build-your-first-pipeline/>

## 1. Design Process

Define data sources, processing requirements, and output – also management and monitoring

1. <https://azure.microsoft.com/en-us/documentation/articles/data-factory-customer-profiling-usecase/>

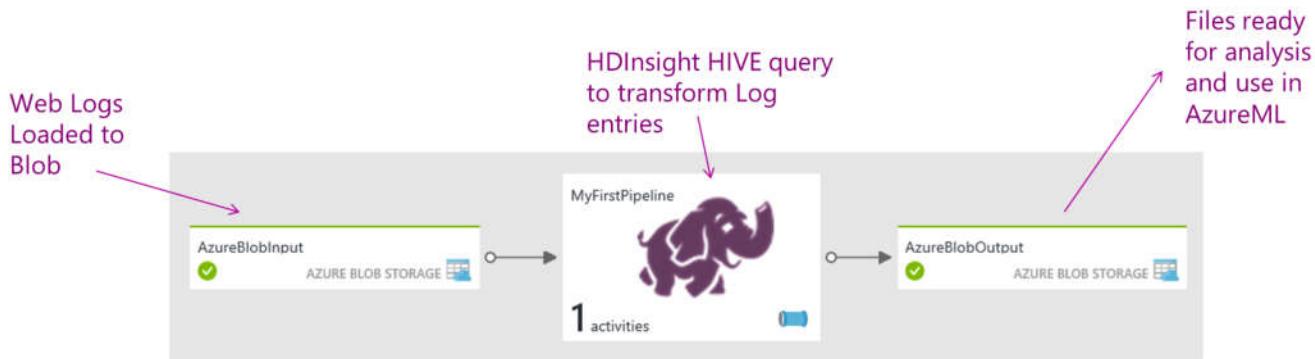
## Example - Churn



1. Video of this process: <https://azure.microsoft.com/en-us/documentation/videos/azure-data-factory-102-analyzing-complex-churn-models-with-azure-data-factory/>

## Simple ADF:

- Business Goal: Transform and Analyze Web Logs each month
- Design Process: Transform Raw Weblogs, using a Hive Query, storing the results in Blob Storage



1. More options: Prepare System:  
<https://azure.microsoft.com/en-us/documentation/articles/data-factory-build-your-first-pipeline-using-editor/> - Follow steps
2. Another Lab: <https://azure.microsoft.com/en-us/documentation/articles/data-factory-samples/>

## 2. Create the Data Factory

Portal, PowerShell, Visual Studio, Azure Resource Manager Templates, SDKs

1. Setting Up: <https://azure.microsoft.com/en-us/documentation/articles/data-factory-build-your-first-pipeline/>

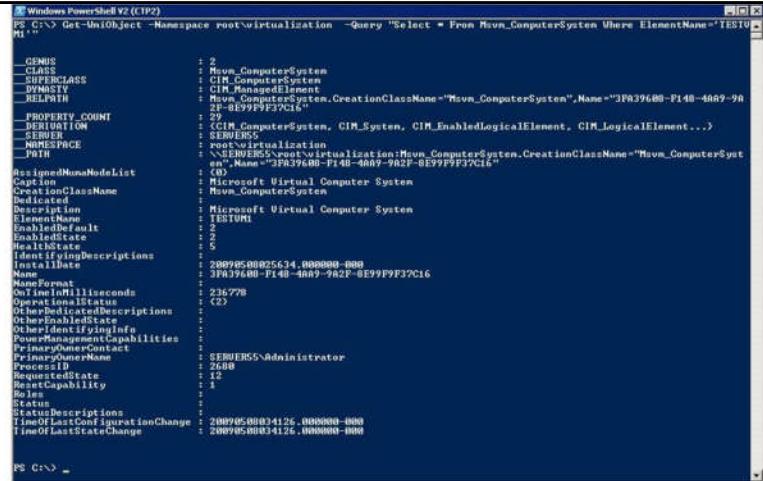
# Using the Portal

The screenshot shows the Microsoft Azure portal's 'Create' blade for 'Data Analytics'. On the left, there's a sidebar with icons for HOME, NOTIFICATIONS, BROWSE, and ACTIVE. The 'BROWSE' section is expanded, showing categories: Compute, Web + Mobile, Data + Storage, Data Analytics (which is selected and highlighted with a red box), Networking, Media + CDN, Hybrid integration, Identity, Developer Services, and Management. To the right, there are four cards: 'HDInsight' (Build a powerful Hadoop cluster in minutes.), 'Machine Learning' (Build, deploy and share advanced analytics solutions), 'Data Factory' (Preview) Transform data into trusted information, and 'Event Hub' (Cloud-scale telemetry ingestion from websites, apps, and devices).

- Quick and easy
- Use for Exploration
- Use when teaching or in a Demo

1. Overview: <https://azure.microsoft.com/en-us/documentation/articles/data-factory-build-your-first-pipeline/>
2. Using the Portal: <https://azure.microsoft.com/en-us/documentation/articles/data-factory-build-your-first-pipeline-using-editor/>

# Using PowerShell



```
Windows PowerShell V2 (C:\)
```

```
PS C:\> Get-UtilObject -Namespace root\virtualization -Query "Select * From MsVm_ComputerSystem Where ElementName='TESTVM'"
```

```
__GENUS          : 2
__CLASS         : 2
__SUPERCLASS   : CIM_ComputerSystem
__DYNASTY       : CIM_ManagedElement
__RELATIONSHIP  :
__PROPERTY_COUNT: 27
__DESCRIPTION   : Microsoft Virtual Computer System
__SERVER        : SERVERS5
__NAMESPACE     : root\virtualization
__PATH          : /root/virtualization/MsVm_ComputerSystem.ElementName="TESTVM"
AssignedNodeList:
Caption          : Microsoft Virtual Computer System
CreationClassName: MsVm_ComputerSystem
DetailedStatus    : 0
EnabledDefault   : 1
EnabledState     : 1
HealthState      : 5
IdentifyingDescriptions:
LastBootUpTime   : 200905080025634.000000-000
Name             : TESTVM
NumberOfProcessors: 1
PowerManagementCapabilities:
PrimaryOwnerName : SERVERS5\Administrator
ProcessorCount   : 2
RequestedState   : 1
ResetCapability  : 1
Status           :
StatusDescriptions:
TimeOfLastConfigurationChange: 200905080034126.000000-000
TimeOfLastStateChange: 200905080034126.000000-000
```

```
PS C:\>
```

- Use in MS Clients
- Use for Automation
- Use for quick set up and tear down

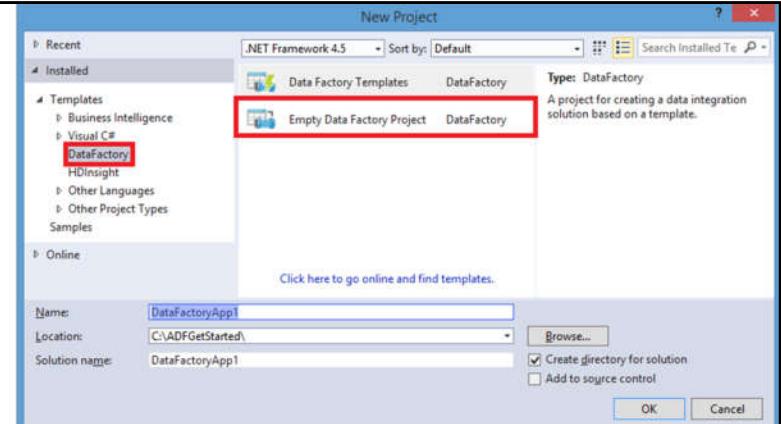
1. Learning Path: <https://azure.microsoft.com/en-us/documentation/articles/data-factory-introduction/>
2. Full Tutorial: <https://azure.microsoft.com/en-us/documentation/articles/data-factory-build-your-first-pipeline/>

## PowerShell ADF Example

1. Run **Add-AzureAccount** and enter the user name and password
2. Run **Get-AzureSubscription** to view all the subscriptions for this account.
3. Run **Select-AzureSubscription** to select the subscription that you want to work with.
4. Run **Switch-AzureMode AzureResourceManager**
5. Run **New-AzureResourceGroup -Name ADFTutorialResourceGroup -Location "West US"**
6. Run **New-AzureDataFactory -ResourceGroupName ADFTutorialResourceGroup -Name DataFactory (your alias) Pipeline -Location "West US"**

1. <https://azure.microsoft.com/en-us/documentation/articles/data-factory-build-your-first-pipeline-using-powershell/>

# Using Visual Studio



- Use in mature dev environments
- Use when integrated into larger development process

1. Overview: <https://azure.microsoft.com/en-us/documentation/articles/data-factory-build-your-first-pipeline/>
2. Using the Portal: <https://azure.microsoft.com/en-us/documentation/articles/data-factory-build-your-first-pipeline-using-editor/>

The image is a composite of two parts. On the left, there is a screenshot of a Microsoft Azure interface. The main title 'Lab:' is at the top in white, followed by a large yellow text 'Create the ADF, Load your Source Data'. Below this, there is a list of steps: '1. Create the ADF', '2. Load your source data', '3. Create the pipeline', '4. Create the sink', and '5. Run the pipeline'. At the bottom left of the screenshot, it says 'Microsoft Azure'. On the right side of the composite image is a photograph of a young man with dark hair, wearing a blue hoodie over a purple t-shirt, standing with his arms crossed against a light-colored brick wall. The Microsoft logo is in the top right corner of the photograph.

1. Open the ADF Student Workbook file from your \Resources folder
2. Follow the steps for Lab 1
3. Then follow the steps for Lab 2
4. Note – There's a useful JSON validator/formatter here:  
<https://jsonformatter.curiousconcept.com/>

### 3. Create Linked Services

*A Connection to Data or  
Connection to Compute Resource  
– Also termed “Data Store”*

1. Data Linking: <https://azure.microsoft.com/en-us/documentation/articles/data-factory-data-movement-activities/>
2. Compute Linking: <https://azure.microsoft.com/en-us/documentation/articles/data-factory-compute-linked-services/>

# Data Options



Source	Sink
Blob	Blob, Table, SQL Database, SQL Data Warehouse, OnPrem SQL Server, SQL Server on IaaS, DocumentDB, OnPrem File System, Data Lake Store
Table	Blob, Table, SQL Database, SQL Data Warehouse, OnPrem SQL Server, SQL Server on IaaS, DocumentDB, Data Lake Store
SQL Database	Blob, Table, SQL Database, SQL Data Warehouse, OnPrem SQL Server, SQL Server on IaaS, DocumentDB, Data Lake Store
SQL Data Warehouse	Blob, Table, SQL Database, SQL Data Warehouse, OnPrem SQL Server, SQL Server on IaaS, DocumentDB, Data Lake Store
DocumentDB	Blob, Table, SQL Database, SQL Data Warehouse, Data Lake Store
Data Lake Store	Blob, Table, SQL Database, SQL Data Warehouse, OnPrem SQL Server, SQL Server on IaaS, DocumentDB, OnPrem File System, Data Lake Store
SQL Server on IaaS	Blob, Table, SQL Database, SQL Data Warehouse, OnPrem SQL Server, SQL Server on IaaS, Data Lake Store
OnPrem File System	Blob, Table, SQL Database, SQL Data Warehouse, OnPrem SQL Server, SQL Server on IaaS, OnPrem File System, Data Lake Store
OnPrem SQL Server	Blob, Table, SQL Database, SQL Data Warehouse, OnPrem SQL Server, SQL Server on IaaS, Data Lake Store
OnPrem Oracle Database	Blob, Table, SQL Database, SQL Data Warehouse, OnPrem SQL Server, SQL Server on IaaS, Data Lake Store
OnPrem MySQL Database	Blob, Table, SQL Database, SQL Data Warehouse, OnPrem SQL Server, SQL Server on IaaS, Data Lake Store
OnPrem DB2 Database	Blob, Table, SQL Database, SQL Data Warehouse, OnPrem SQL Server, SQL Server on IaaS, Data Lake Store
OnPrem Teradata Database	Blob, Table, SQL Database, SQL Data Warehouse, OnPrem SQL Server, SQL Server on IaaS, Data Lake Store
OnPrem Sybase Database	Blob, Table, SQL Database, SQL Data Warehouse, OnPrem SQL Server, SQL Server on IaaS, Data Lake Store
OnPrem PostgreSQL Database	Blob, Table, SQL Database, SQL Data Warehouse, OnPrem SQL Server, SQL Server on IaaS, Data Lake Store

1. Data Movement requirements:

<https://azure.microsoft.com/en-us/documentation/articles/data-factory-data-movement-activities/>

2. From on-premises, requires Data Management Gateway:

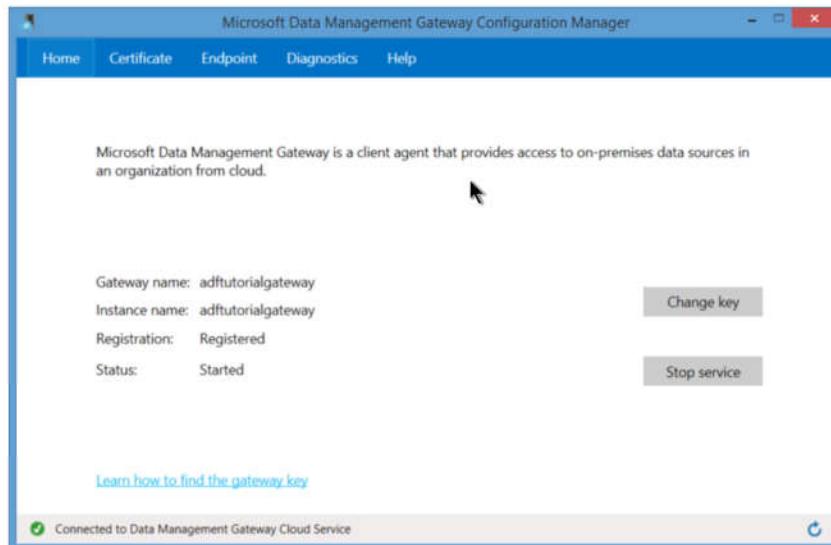
<https://azure.microsoft.com/en-us/documentation/articles/data-factory-move-data-between-onprem-and-cloud/>

## Activity Options

Transformation activity	Compute environment
Hive	HDInsight [Hadoop]
Pig	HDInsight [Hadoop]
MapReduce	HDInsight [Hadoop]
Hadoop Streaming	HDInsight [Hadoop]
Machine Learning activities: Batch Execution and Update Resource	Azure VM
Stored Procedure	Azure SQL
Data Lake Analytics U-SQL	Azure Data Lake Analytics
DotNet	HDInsight [Hadoop] or Azure Batch

1. Main Document Site: <https://azure.microsoft.com/en-us/documentation/articles/data-factory-data-transformation-activities/>

# Gateway for On-Prem



1. Activities: <https://azure.microsoft.com/en-us/documentation/articles/data-factory-create-pipelines/>

CreateHDICluster.txt:

```
{  
  "name": "HDInsightOnDemandLinkedService",  
  "properties": {  
    "type": "HDInsightOnDemand",  
    "typeProperties": {  
      "version": "3.1",  
      "clusterSize": 1,  
      "timeToLive": "00:30:00",  
      "linkedServiceName": "AzureStorageLinkedService"  
    }  
  }  
}
```



Lab:

Create the Linked Services

Microsoft Azure



Microsoft

1. Open the ADF Student Workbook file from your \Resources folder
2. Follow the steps for Lab 3

## 4: Create Datasets

Named reference  
or pointer to data

1. Main Dataset Document Site:

<https://azure.microsoft.com/en-us/documentation/articles/data-factory-create-datasets/>

# Dataset Concepts

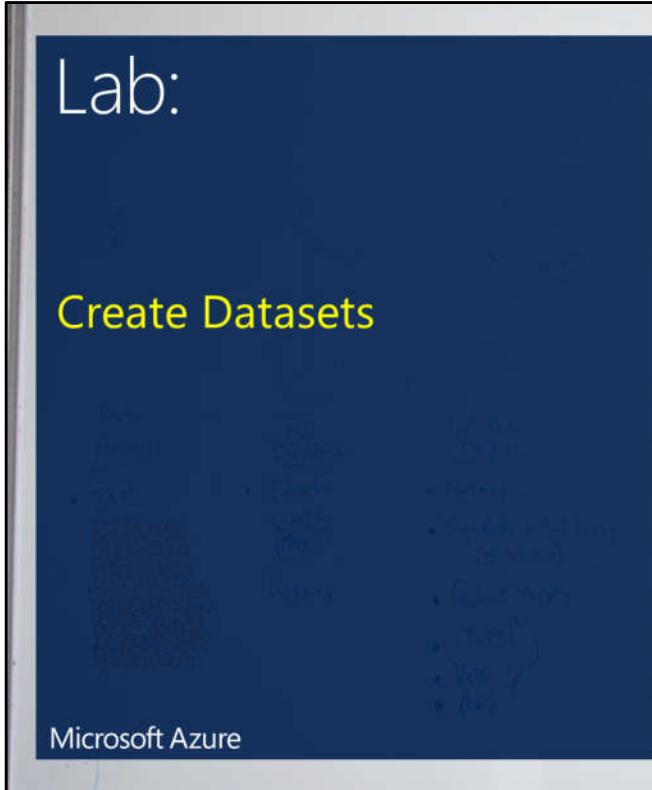
```
{  
  "name": "<name of dataset>",  
  "properties":  
  {  
    "structure": [],  
    "type": "<type of dataset>",  
    "external": <boolean flag to indicate external data>,  
    "typeProperties":  
    {  
    }  
  },  
  "availability":  
  {  
  }  
}  
}  
}.
```

1. <https://azure.microsoft.com/en-us/documentation/articles/data-factory-build-your-first-pipeline-using-editor/>

AzureBlobOutput.txt:

```
{  
  "name": "AzureBlobOutput",  
  "properties": {  
    "type": "AzureBlob",  
    "linkedServiceName": "StorageLinkedService",  
    "typeProperties": {  
      "folderPath": "data/partitioneddata",  
      "format": {  
        "type": "TextFormat",  
        "columnDelimiter": ","  
      }  
    },  
    "availability": {  
      "frequency": "Month",  
      "interval": 1  
    }  
  }  
}
```

{}



Lab:

Create Datasets

Microsoft Azure



Microsoft

1. Open the ADF Student Workbook file from your \Resources folder
2. Follow the steps for Lab 4

## 5. Create Pipelines

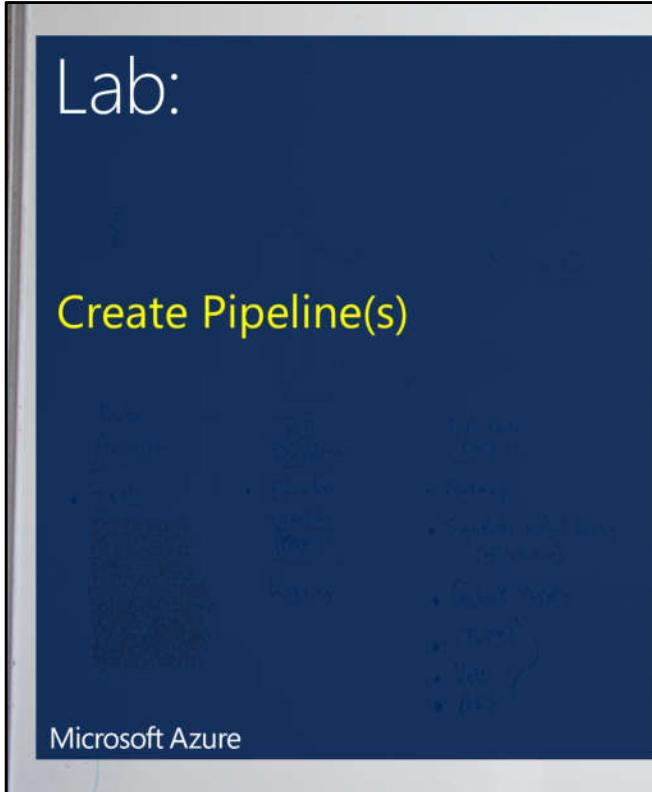
*Logical Grouping of Activities*

1. Main Pipeline Documentation:  
<https://azure.microsoft.com/en-us/documentation/articles/data-factory-create-pipelines/>

# Pipeline Concepts

```
{  
  "name": "PipelineName",  
  "properties":  
  {  
    "description" : "pipeline description",  
    "activities":  
    [  
  
    ],  
    "start": "<start date-time>",  
    "end": "<end date-time>"  
  }  
}
```

1. <https://azure.microsoft.com/en-us/documentation/articles/data-factory-build-your-first-pipeline-using-editor/>
2. Activities: <https://azure.microsoft.com/en-us/documentation/articles/data-factory-create-pipelines/>



Lab:

Create Pipeline(s)

Microsoft Azure



The image shows a young man with dark hair, smiling broadly. He is wearing a bright blue zip-up hoodie over a dark t-shirt and jeans. He has his arms crossed. The background is a light-colored concrete wall. In the top right corner of the image frame, there is a small Microsoft logo.

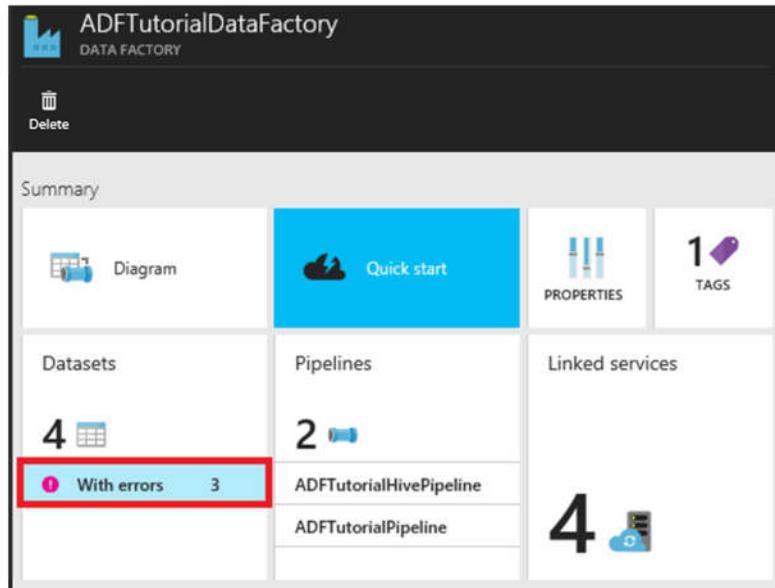
1. Open the ADF Student Workbook file from your \Resources folder
2. Follow the steps for Lab 5

## 6. Manage and Monitor

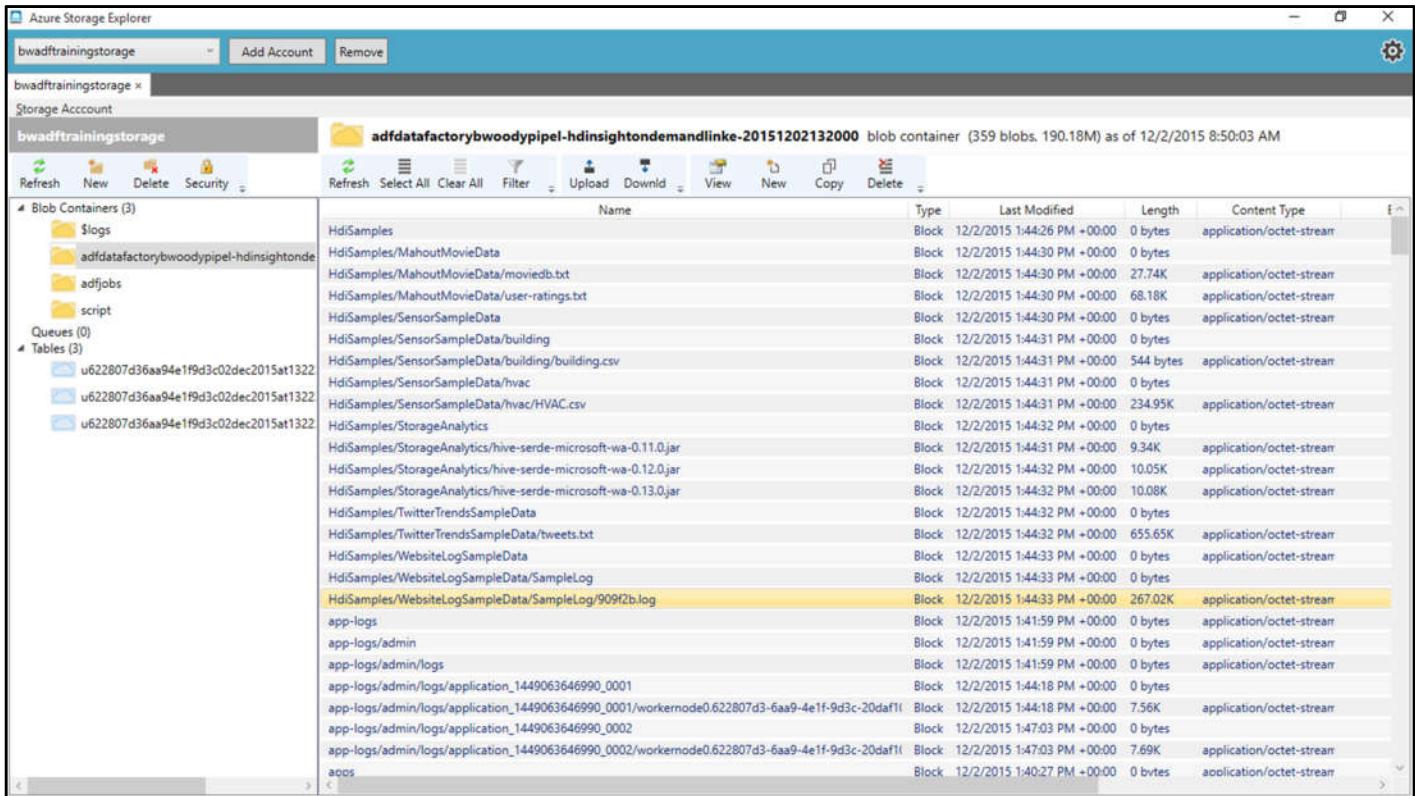
Scheduling, Monitoring,  
Disposition

1. Main Concepts: <https://azure.microsoft.com/en-us/documentation/articles/data-factory-monitor-manage-pipelines/>

# Locating Failures within a Pipeline



1. PowerShell script to help deal with errors in ADF:  
<http://blogs.msdn.com/b/karang/archive/2015/11/13/azure-data-factory-detecting-and-re-running-failed-adf-slices.aspx>

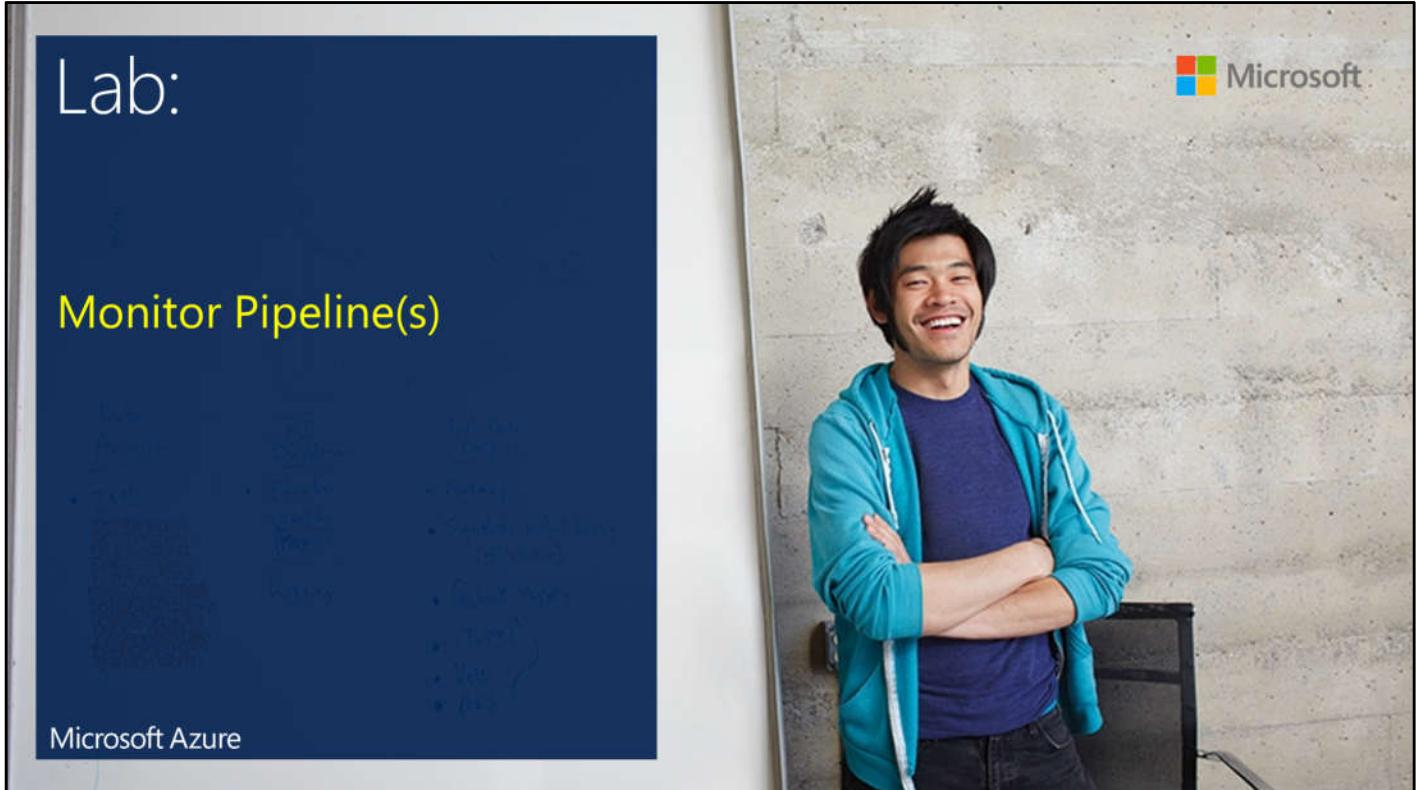


The screenshot shows the Azure Storage Explorer interface. The left sidebar lists storage accounts: 'bwadftestingstorage' and 'bwadftestingstorage x'. Under 'bwadftestingstorage', there are sections for Blob Containers (3), Queues (0), and Tables (3). The Blob Containers section shows a list of blobs under 'adfdatabfactorybwoodypipel-hdinsightondemandlinke-20151202132000'. The Tables section shows three tables: 'u622807d36aa94e1f9d3c02dec2015at1322', 'u622807d36aa94e1f9d3c02dec2015at1322', and 'u622807d36aa94e1f9d3c02dec2015at1322'. The right pane displays the details of the blobs in the selected container, including Name, Type, Last Modified, Length, and Content Type.

Name	Type	Last Modified	Length	Content Type
HdiSamples	Block	12/2/2015 1:44:26 PM +0:00	0 bytes	application/octet-stream
HdiSamples/MahoutMovieData	Block	12/2/2015 1:44:30 PM +0:00	0 bytes	application/octet-stream
HdiSamples/MahoutMovieData/moviedb.txt	Block	12/2/2015 1:44:30 PM +0:00	27.74K	application/octet-stream
HdiSamples/MahoutMovieData/user-ratings.txt	Block	12/2/2015 1:44:30 PM +0:00	68.16K	application/octet-stream
HdiSamples/SensorSampleData	Block	12/2/2015 1:44:30 PM +0:00	0 bytes	application/octet-stream
HdiSamples/SensorSampleData/building	Block	12/2/2015 1:44:31 PM +0:00	0 bytes	application/octet-stream
HdiSamples/SensorSampleData/building/building.csv	Block	12/2/2015 1:44:31 PM +0:00	544 bytes	application/octet-stream
HdiSamples/SensorSampleData/hvac	Block	12/2/2015 1:44:31 PM +0:00	0 bytes	application/octet-stream
HdiSamples/SensorSampleData/hvac/HVAC.csv	Block	12/2/2015 1:44:31 PM +0:00	234.95K	application/octet-stream
HdiSamples/StorageAnalytics	Block	12/2/2015 1:44:32 PM +0:00	0 bytes	application/octet-stream
HdiSamples/StorageAnalytics/hive-serde-microsoft-wa-0.11.0.jar	Block	12/2/2015 1:44:31 PM +0:00	9.34K	application/octet-stream
HdiSamples/StorageAnalytics/hive-serde-microsoft-wa-0.12.0.jar	Block	12/2/2015 1:44:32 PM +0:00	10.05K	application/octet-stream
HdiSamples/StorageAnalytics/hive-serde-microsoft-wa-0.13.0.jar	Block	12/2/2015 1:44:32 PM +0:00	10.08K	application/octet-stream
HdiSamples/TwitterTrendsSampleData	Block	12/2/2015 1:44:32 PM +0:00	0 bytes	application/octet-stream
HdiSamples/TwitterTrendsSampleData/tweets.txt	Block	12/2/2015 1:44:32 PM +0:00	655.65K	application/octet-stream
HdiSamples/WebsiteLogSampleData	Block	12/2/2015 1:44:33 PM +0:00	0 bytes	application/octet-stream
HdiSamples/WebsiteLogSampleData/SampleLog	Block	12/2/2015 1:44:33 PM +0:00	0 bytes	application/octet-stream
HdiSamples/WebsiteLogSampleData/SampleLog/909f2b.log	Block	12/2/2015 1:44:33 PM +0:00	267.02K	application/octet-stream
app-logs	Block	12/2/2015 1:41:59 PM +0:00	0 bytes	application/octet-stream
app-logs/admin	Block	12/2/2015 1:41:59 PM +0:00	0 bytes	application/octet-stream
app-logs/admin/logs	Block	12/2/2015 1:41:59 PM +0:00	0 bytes	application/octet-stream
app-logs/admin/logs/application_1449063646990_0001	Block	12/2/2015 1:44:18 PM +0:00	0 bytes	application/octet-stream
app-logs/admin/logs/application_1449063646990_0001/workernode0.622807d3-6aa9-4e1f-9d3c-20daf1	Block	12/2/2015 1:44:18 PM +0:00	7.56K	application/octet-stream
app-logs/admin/logs/application_1449063646990_0002	Block	12/2/2015 1:47:03 PM +0:00	0 bytes	application/octet-stream
app-logs/admin/logs/application_1449063646990_0002/workernode0.622807d3-6aa9-4e1f-9d3c-20daf1	Block	12/2/2015 1:47:03 PM +0:00	7.69K	application/octet-stream
aoss	Block	12/2/2015 1:40:27 PM +0:00	0 bytes	application/octet-stream

## 1. PowerShell script to help deal with errors in ADF:

<http://blogs.msdn.com/b/karang/archive/2015/11/13/azure-data-factory-detecting-and-re-running-failed-adf-slices.aspx>



The image is a composite of two parts. On the left, there is a screenshot of a Microsoft Azure portal page. The title 'Lab:' is at the top, followed by 'Monitor Pipeline(s)'. Below this, there is a list of pipeline items. At the bottom left of the screenshot, it says 'Microsoft Azure'. On the right side of the composite image is a photograph of a young man with dark hair, wearing a blue hoodie over a purple t-shirt, standing with his arms crossed against a concrete wall. The Microsoft logo is visible in the top right corner of the photo.

1. Open the ADF Student Workbook file from your \Resources folder
2. Follow the steps for Lab 6



1. Understand ADF and its constructs
2. Implement an ADF Pipeline referencing Data Sources and with various Activities
3. Understand how HDInsight can be used to process data
4. Understand the HIVE language and how it is used

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Questions?