

ETL Using Apache Spark

Estimated time needed: 20 minutes

The purpose of this lab is to show you how to pull data from a source system, transform it and store it back to the target system.

Objectives

After completing this lab, you will be able to:

1. Pull data from the HMP dataset.
2. Create a Spark Dataframe from the raw data.
3. Write the Dataframe to CSV.
4. Convert the CSV data to PARQUET.
5. Condense PARQUET to a single file.
6. Upload the Parquet file to Cloud Object Store

But don't be scared, we provide you with a set of sample notebooks you can modify and hook together. The library where you can get the notebooks from is called CLAIMED – the Component Library for AI, Machine Learning, ETL, and Data Science and is an open-source library available on the [CLAIMED repo](https://github.com/IBM/claimed/tree/master/component-library) (<https://github.com/IBM/claimed/tree/master/component-library>).

You'll use [Elyra – a JupyterLab extension](https://elyra.readthedocs.io/en/stable/?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01) (https://elyra.readthedocs.io/en/stable/?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01) for editing the notebooks; and, if you like you can use the [pipeline editor](https://elyra.readthedocs.io/en/latest/getting_started/overview.html?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01#ai-pipelines-visual-editor) (https://elyra.readthedocs.io/en/latest/getting_started/overview.html?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01#ai-pipelines-visual-editor) of Elyra to visually join them into a data pipeline.

Elyra is the foundation of the [IBM Watson Studio Pipelines](https://medium.com/ibm-data-ai/automating-the-ai-lifecycle-with-ibm-watson-studio-orchestration-flow-4450f1d725d6?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01) (https://medium.com/ibm-data-ai/automating-the-ai-lifecycle-with-ibm-watson-studio-orchestration-flow-4450f1d725d6?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01) tool which can be used in the cloud. Feel free to give it a shot as well to experience how a business user would do the job.

We'll use the HMP dataset. The dataset is publically available [here](https://github.com/wchill/HMP_Dataset) (https://github.com/wchill/HMP_Dataset).

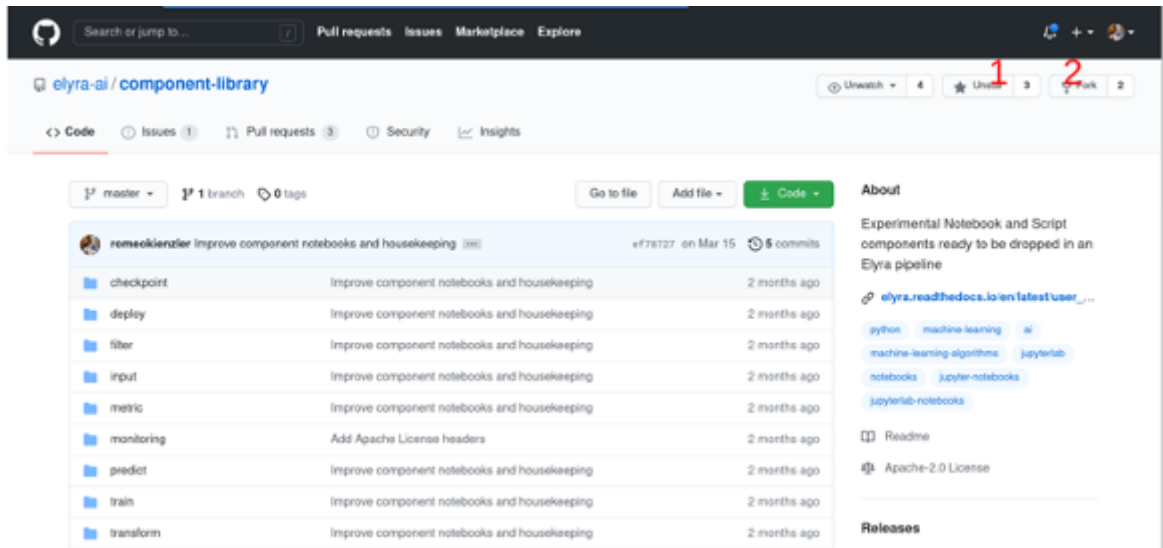
In previous generation BigData systems, HDFS was the core data store. Nowadays, S3 compatible Cloud Object Storage (COS) is the de-facto standard across clouds and also starts to get traction in local data centers (Ceph, Minio).

So let's get started with the lab!

Exercise 1 : Import the CLAIMED library to JupyterLab

1. In a separate browser tab, please open the CLAIMED component library: [GitHub Link](https://github.com/IBM/claimed/tree/master/component-library) (<https://github.com/IBM/claimed/tree/master/component-library>)
2. Don't hesitate to give us a star (1) :, then please click the Fork button. (2)

(Taking this action enables you to work using your own copy - you then can replace the link to your fork below in the next cell)



Now let's clone (download) the library:

In [1]:

```
%%bash
rm -Rf claimed
git clone https://github.com/IBM/claimed.git
cd claimed
```

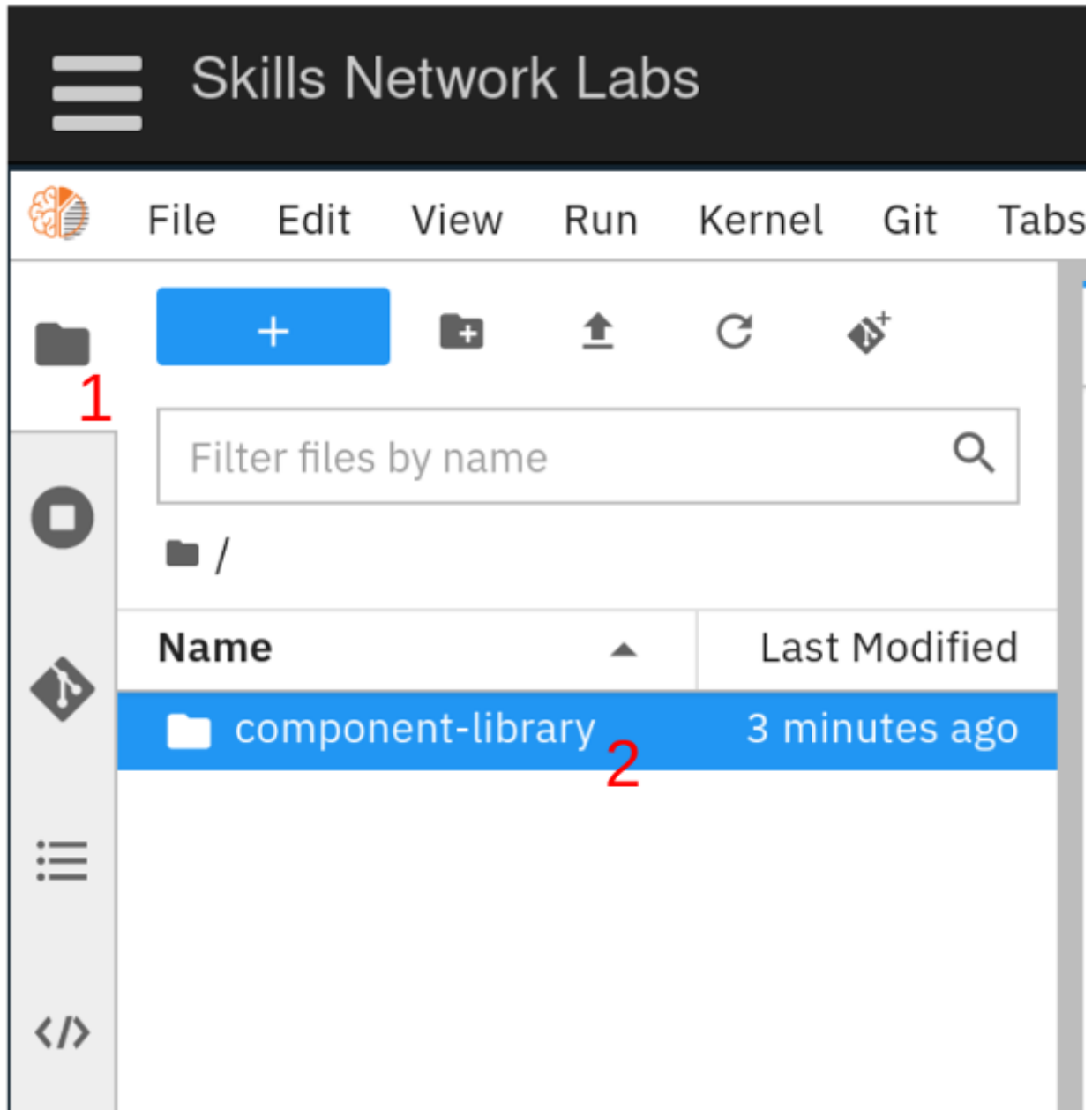
Cloning into 'claimed'...
Checking out files: 100% (434/434), done.

Congratulations, you've successfully imported the component library.

Exercise 2 : Explore the CLAIMED component library

Now it's time to familiarize yourself a bit with some components (Jupyter Notebooks) in the component library.

1. In JupyterLab, please go to the file explorer (1), double-click on folder "claimed" and then double click on the folder "component-library" (2)



1. Please open the folder called "transform" (1) and open the notebook called spark-csv-to-parquet (2). The prefix "spark" indicates that the notebook is using Apache Spark to perform its task. From the name you can deduce that this component transforms a file from "parquet" to "csv" format. Each notebook starts with a title and description of what it is supposed to do, followed by commands to install library dependencies. Then, a set of parameters this notebook accepts is provided (3), followed by an actual implementation of pulling those parameters from the environment (4). Finally, the actual task is implemented in source code (5).

The screenshot displays the JupyterLab interface. On the left, the file browser shows the directory structure: `/ component-library / transform /`. The file `spark-csv-to-par...` is selected. On the right, the code editor shows the following Python code:

```
[2]: # @param data_dir temporal data storage for local execution
# @param data_csv csv path and file name (default: data.csv)
# @param data_parquet path and parquet file name (default: data.parquet)
# @param master url of master (default: local mode)

[3]: from pyspark import SparkContext, SparkConf
from pyspark.sql import SparkSession
import os

[4]: data_csv = os.environ.get('data_csv', 'data.csv')
data_parquet = os.environ.get('data_parquet', 'data.parquet')
master = os.environ.get('master', "local[*]")
data_dir = os.environ.get('data_dir', '../data/')

[5]: skip = False

if os.path.exists(data_dir+data_parquet):
    skip = True

[6]: if not skip:
    sc = SparkContext.getOrCreate(SparkConf().setMaster(master))
    spark = SparkSession.builder.getOrCreate()

[7]: if not skip:
    df = spark.read.option('header', 'true').csv(data_dir + data_csv)
```

1. Please explore the other components in the library and look at how they are implemented. They serve as cookie-cutters, or examples, for an abundance of daily data science tasks and hopefully you can learn from them.

Exercise 3 : Start the ETL process

Task A : Pull the data

Now we need to pull data from a remote github repository and convert it to CSV. You can open the notebook called *input-hmp.ipynb* in folder *claimed/component-library/input* and run each cell top down, one by one. Alternatively, the following cell is doing the job as well. If you run the code by executing the cell below, please open the notebook in parallel and investigate how it was implemented.

Please note, that that way we can pass a parameter called *sample* which reduces data size and processing time. Sampling is often done on "Non Big Data" Systems, but in Apache Spark this is not necessary most of the times because Apache Spark can handle any amount of data - so sampling is done here only for saving time during the lab.

Note: A cell which creates a lot of output can be switched into scrolling mode. Just right-click into the output canvas (1) and click on "Enable Scrolling for Outputs" (2)

```

if df is None:
    df = temp_df
else:
    df = df.union(temp_df)

```

Accelerometer-2012-05-29-16-43-41-pour_wate
 Accelerometer-2012-05-30-18-26-02-pour_wate
 Accelerometer-2012-05-29-17-12-07-pour_wate
 Accelerometer-2012-06-09-22-58-08-pour_wate
 Accelerometer-2011-06-06-09-45-45-pour_wate
 Accelerometer-2011-06-02-17-04-09-pour_wate
 Accelerometer-2011-05-31-15-11-25-pour_wate

- Delete Cells
- Split Cell
- Merge Selected Cells
- Create New View for Output
- Clear Outputs
- Save As Code Snippet
- Clear All Outputs
- Enable Scrolling for Outputs
- Disable Scrolling for Outputs

1. After quite some time you should see a folder called "data.csv" in the "data" directory you've previously created. Please note that Apache Spark always creates folders containing individual files, one per partition. This is not a problem because Spark doesn't distinguish between files and folders and treats folders as they were files. (The only way to get a file is to repartition the data frame to one and extract/rename the file inside the folder `df = df.repartition(1)`)

In [2]:

```
!python ./claimed/component-library/input/input-hmp.ipynb data_dir=./data/ sample=0.01
```

```
]0;IPython: labs/BD0231EN 37
Starting installation...
Please <<RESTART YOUR KERNEL>> (Kernel->Restart Kernel and Clear All Outputs)
22/02/04 12:40:55 WARN util.NativeCodeLoader: Unable to load native-hadoop
library for your platform... using builtin-java classes where applicable
Setting default log level to "WARN".
To adjust logging level use sc.setLogLevel(newLevel). For SparkR, use setL
ogLevel(newLevel).
Cloning into 'HMP_Dataset'...
remote: Enumerating objects: 865, done.
remote: Total 865 (delta 0), reused 0 (delta 0), pack-reused 865
Receiving objects: 100% (865/865), 1010.96 KiB | 17.43 MiB/s, done.
Skipping: Accelerometer-2012-05-29-16-43-41-pour_water-f2.txt
Skipping: Accelerometer-2012-05-30-18-26-02-pour_water-f3.txt
Skipping: Accelerometer-2012-05-29-17-12-07-pour_water-m3.txt
Skipping: Accelerometer-2012-06-09-22-58-08-pour_water-m11.txt
Skipping: Accelerometer-2011-06-06-09-45-45-pour_water-f1.txt
Skipping: Accelerometer-2011-06-02-17-04-09-pour_water-f4.txt
Skipping: Accelerometer-2011-05-31-15-11-25-pour_water-f1.txt
Skipping: Accelerometer-2011-06-01-14-16-35-pour_water-f1.txt
Skipping: Accelerometer-2011-06-06-09-39-30-pour_water-f1.txt
Skipping: Accelerometer-2011-06-02-17-45-45-pour_water-m1.txt
Skipping: Accelerometer-2012-03-23-03-54-26-pour_water-m9.txt
Skipping: Accelerometer-2011-03-24-10-04-32-pour_water-f1.txt
Skipping: Accelerometer-2012-05-28-17-41-55-pour_water-m1.txt
Skipping: Accelerometer-2011-06-02-17-33-30-pour_water-m1.txt
Skipping: Accelerometer-2011-05-30-21-51-05-pour_water-m2.txt
Skipping: Accelerometer-2012-06-09-22-58-28-pour_water-m11.txt
Skipping: Accelerometer-2011-06-06-09-47-48-pour_water-f1.txt
Skipping: Accelerometer-2012-06-07-21-31-05-pour_water-f4.txt
Skipping: Accelerometer-2012-05-29-17-10-30-pour_water-m3.txt
Skipping: Accelerometer-2012-06-07-21-31-24-pour_water-f4.txt
Skipping: Accelerometer-2011-06-01-14-18-36-pour_water-f1.txt
Skipping: Accelerometer-2012-05-30-19-07-14-pour_water-m4.txt
Skipping: Accelerometer-2012-05-30-18-27-41-pour_water-f3.txt
Skipping: Accelerometer-2012-06-07-21-28-23-pour_water-f4.txt
Skipping: Accelerometer-2011-06-01-14-17-02-pour_water-f1.txt
Skipping: Accelerometer-2012-05-30-19-59-17-pour_water-m3.txt
Skipping: Accelerometer-2011-06-02-17-06-44-pour_water-f4.txt
Skipping: Accelerometer-2011-06-02-17-06-15-pour_water-f4.txt
Skipping: Accelerometer-2012-05-29-17-19-55-pour_water-m3.txt
Skipping: Accelerometer-2012-06-07-21-29-48-pour_water-f4.txt
Skipping: Accelerometer-2011-06-01-14-25-16-pour_water-f1.txt
Accelerometer-2011-06-06-09-48-59-pour_water-f1.txt
Skipping: Accelerometer-2011-04-05-18-54-14-pour_water-f1.txt
Skipping: Accelerometer-2012-03-26-05-01-39-pour_water-m3.txt
Skipping: Accelerometer-2011-03-24-13-30-01-pour_water-f1.txt
Skipping: Accelerometer-2011-06-06-09-42-11-pour_water-f1.txt
Skipping: Accelerometer-2012-06-07-21-31-48-pour_water-f4.txt
Skipping: Accelerometer-2012-05-30-18-27-15-pour_water-f3.txt
Skipping: Accelerometer-2012-05-30-19-57-40-pour_water-m3.txt
Skipping: Accelerometer-2011-05-31-16-34-32-pour_water-f1.txt
Skipping: Accelerometer-2012-03-23-03-55-46-pour_water-m9.txt
Skipping: Accelerometer-2011-05-30-21-05-39-pour_water-f1.txt
Skipping: Accelerometer-2012-05-25-18-37-06-pour_water-f4.txt
Skipping: Accelerometer-2011-06-06-09-56-28-pour_water-f1.txt
Skipping: Accelerometer-2012-05-28-17-49-34-pour_water-m1.txt
Skipping: Accelerometer-2012-06-09-22-56-17-pour_water-m11.txt
```


Skipping: Accelerometer-2012-06-09-22-56-53-pour_water-m11.txt
Skipping: Accelerometer-2012-06-07-21-30-37-pour_water-f4.txt
Accelerometer-2011-06-02-16-52-30-pour_water-f4.txt
Skipping: Accelerometer-2011-06-01-14-32-38-pour_water-f1.txt
Skipping: Accelerometer-2012-06-07-21-33-21-pour_water-f4.txt
Skipping: Accelerometer-2012-05-30-19-08-20-pour_water-m4.txt
Skipping: Accelerometer-2012-05-28-17-46-43-pour_water-m1.txt
Skipping: Accelerometer-2011-06-02-17-23-16-pour_water-m1.txt
Skipping: Accelerometer-2012-06-09-22-55-08-pour_water-m11.txt
Accelerometer-2012-03-26-05-03-27-pour_water-m3.txt
Skipping: Accelerometer-2012-06-09-22-55-42-pour_water-m11.txt
Skipping: Accelerometer-2011-06-06-09-44-12-pour_water-f1.txt
Skipping: Accelerometer-2011-04-11-12-55-26-pour_water-f1.txt
Skipping: Accelerometer-2012-06-07-21-28-48-pour_water-f4.txt
Skipping: Accelerometer-2012-06-07-21-29-09-pour_water-f4.txt
Skipping: Accelerometer-2011-06-06-09-40-34-pour_water-f1.txt
Skipping: Accelerometer-2012-06-09-22-54-40-pour_water-m11.txt
Skipping: Accelerometer-2011-06-01-16-46-50-pour_water-f1.txt
Skipping: Accelerometer-2012-06-07-21-32-12-pour_water-f4.txt
Skipping: Accelerometer-2011-06-01-14-13-29-pour_water-f1.txt
Skipping: Accelerometer-2012-05-30-18-26-49-pour_water-f3.txt
Skipping: Accelerometer-2011-06-06-09-46-20-pour_water-f1.txt
Skipping: Accelerometer-2012-05-28-17-43-20-pour_water-m1.txt
Skipping: Accelerometer-2012-05-30-19-50-42-pour_water-f2.txt
Skipping: Accelerometer-2012-03-26-04-53-59-pour_water-f2.txt
Skipping: Accelerometer-2011-06-02-17-28-27-pour_water-m1.txt
Skipping: Accelerometer-2012-06-07-21-35-50-pour_water-f4.txt
Skipping: Accelerometer-2011-06-06-09-50-17-pour_water-f1.txt
Skipping: Accelerometer-2012-06-07-21-34-47-pour_water-f4.txt
Skipping: Accelerometer-2012-05-30-19-56-40-pour_water-m3.txt
Skipping: Accelerometer-2012-05-25-18-29-48-pour_water-f4.txt
Skipping: Accelerometer-2012-05-25-18-34-46-pour_water-f4.txt
Skipping: Accelerometer-2012-05-25-18-31-58-pour_water-f4.txt
Skipping: Accelerometer-2011-06-02-16-50-40-pour_water-f4.txt
Skipping: Accelerometer-2012-05-30-19-54-24-pour_water-f2.txt
Skipping: Accelerometer-2012-06-07-21-30-16-pour_water-f4.txt
Skipping: Accelerometer-2011-03-24-10-51-12-pour_water-f1.txt
Skipping: Accelerometer-2012-05-30-19-52-29-pour_water-f2.txt
Skipping: Accelerometer-2011-06-06-09-51-53-pour_water-f1.txt
Skipping: Accelerometer-2012-05-30-19-08-50-pour_water-m4.txt
Skipping: Accelerometer-2012-05-29-16-49-00-pour_water-f2.txt
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Skipping: Accelerometer-2011-06-06-09-49-51-pour_water-f1.txt
Skipping: Accelerometer-2012-03-26-04-55-40-pour_water-f2.txt
Skipping: Accelerometer-2012-06-09-22-57-12-pour_water-m11.txt
Skipping: Accelerometer-2011-06-01-14-12-53-pour_water-f1.txt
Skipping: Accelerometer-2012-06-07-21-35-28-pour_water-f4.txt
Skipping: Accelerometer-2012-05-30-19-07-43-pour_water-m4.txt
Skipping: Accelerometer-2012-06-07-21-32-37-pour_water-f4.txt
Skipping: Accelerometer-2011-06-01-14-27-40-pour_water-f1.txt
Skipping: Accelerometer-2012-03-23-03-46-21-pour_water-m9.txt
Skipping: Accelerometer-2012-06-07-21-27-46-pour_water-f4.txt
Skipping: Accelerometer-2011-06-06-09-55-25-pour_water-f1.txt
Skipping: Accelerometer-2012-06-07-21-34-22-pour_water-f4.txt
Skipping: Accelerometer-2011-04-12-21-42-53-standup_chair-m8.txt
Skipping: Accelerometer-2012-05-25-18-27-29-standup_chair-f4.txt
Skipping: Accelerometer-2011-12-11-08-09-59-standup_chair-f4.txt
Skipping: Accelerometer-2011-12-11-08-15-55-standup_chair-f4.txt
Skipping: Accelerometer-2011-06-01-14-43-42-standup_chair-f1.txt

Skipping: Accelerometer-2012-03-26-04-54-30-standup_chair-f2.txt
Skipping: Accelerometer-2011-03-23-10-39-18-standup_chair-f1.txt
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Accelerometer-2011-06-02-16-43-22-standup_chair-f4.txt
Skipping: Accelerometer-2011-03-24-16-09-19-standup_chair-f2.txt
Skipping: Accelerometer-2011-06-02-17-05-17-standup_chair-f4.txt
Skipping: Accelerometer-2011-04-12-21-45-21-standup_chair-m8.txt
Accelerometer-2011-12-11-08-19-58-standup_chair-m2.txt
Skipping: Accelerometer-2011-06-02-17-26-55-standup_chair-m1.txt
Skipping: Accelerometer-2012-05-29-17-12-51-standup_chair-m3.txt
Skipping: Accelerometer-2011-04-11-11-48-09-standup_chair-f1.txt
Skipping: Accelerometer-2011-06-02-16-44-18-standup_chair-f4.txt
Skipping: Accelerometer-2011-06-01-14-50-10-standup_chair-f1.txt
Skipping: Accelerometer-2011-03-23-10-42-01-standup_chair-f1.txt
Skipping: Accelerometer-2011-05-30-10-23-55-standup_chair-m1.txt
Skipping: Accelerometer-2012-05-28-17-40-45-standup_chair-m1.txt
Skipping: Accelerometer-2011-06-01-14-40-19-standup_chair-f1.txt
Skipping: Accelerometer-2011-06-02-16-55-12-standup_chair-f4.txt
Skipping: Accelerometer-2011-12-05-09-48-17-standup_chair-f1.txt
Skipping: Accelerometer-2012-03-23-03-48-20-standup_chair-m9.txt
Skipping: Accelerometer-2011-05-30-08-24-19-standup_chair-f1.txt
Skipping: Accelerometer-2011-06-01-14-39-38-standup_chair-f1.txt
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Skipping: Accelerometer-2011-05-30-10-31-41-standup_chair-m1.txt
Skipping: Accelerometer-2011-06-01-14-38-03-standup_chair-f1.txt
Skipping: Accelerometer-2011-12-11-08-13-41-standup_chair-f4.txt
Skipping: Accelerometer-2012-03-26-04-58-13-standup_chair-f2.txt
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Skipping: Accelerometer-2011-03-23-10-47-59-standup_chair-f1.txt
Skipping: Accelerometer-2011-05-31-14-59-53-standup_chair-f1.txt
Skipping: Accelerometer-2011-03-24-11-19-29-standup_chair-f1.txt
Skipping: Accelerometer-2011-05-30-09-25-14-standup_chair-f1.txt
Skipping: Accelerometer-2011-03-24-10-38-17-standup_chair-f1.txt
Skipping: Accelerometer-2011-06-02-17-41-11-standup_chair-m1.txt
Skipping: Accelerometer-2011-03-23-10-45-51-standup_chair-f1.txt
Skipping: Accelerometer-2011-12-05-09-55-36-standup_chair-f1.txt
Skipping: Accelerometer-2012-05-25-18-28-24-standup_chair-f4.txt
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Skipping: Accelerometer-2011-05-30-08-32-03-standup_chair-f1.txt
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Skipping: Accelerometer-2012-05-29-17-14-27-standup_chair-m3.txt
Skipping: Accelerometer-2011-06-02-16-45-48-standup_chair-f4.txt
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Skipping: Accelerometer-2011-12-11-08-24-09-standup_chair-m2.txt
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Skipping: Accelerometer-2011-06-02-17-44-52-standup_chair-m1.txt
Skipping: Accelerometer-2011-12-05-09-50-23-standup_chair-f1.txt
Skipping: Accelerometer-2011-06-01-14-41-32-standup_chair-f1.txt
Skipping: Accelerometer-2011-05-30-21-33-37-standup_chair-m2.txt
Skipping: Accelerometer-2011-06-02-17-25-13-standup_chair-m1.txt
Skipping: Accelerometer-2012-05-29-16-43-05-standup_chair-f2.txt
Skipping: Accelerometer-2012-05-28-17-45-43-standup_chair-m1.txt
Skipping: Accelerometer-2011-05-31-16-23-03-standup_chair-f1.txt
Skipping: Accelerometer-2011-06-02-17-31-39-standup_chair-m1.txt

Skipping: Accelerometer-2011-06-01-14-46-35-standup_chair-f1.txt
Skipping: Accelerometer-2011-05-30-09-24-04-standup_chair-f1.txt
Skipping: Accelerometer-2011-05-30-20-50-04-standup_chair-f1.txt
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Skipping: Accelerometer-2012-05-25-18-36-27-drink_glass-f4.txt
Skipping: Accelerometer-2011-03-24-13-31-22-drink_glass-f1.txt
Skipping: Accelerometer-2012-05-30-21-48-45-drink_glass-m2.txt
Skipping: Accelerometer-2012-05-30-19-53-49-drink_glass-f2.txt
Skipping: Accelerometer-2012-03-23-03-47-36-drink_glass-m9.txt

Skipping: Accelerometer-2011-04-12-21-44-55-drink_glass-m8.txt
Skipping: Accelerometer-2012-05-30-21-48-13-drink_glass-m2.txt
Skipping: Accelerometer-2011-03-24-11-20-43-descend_stairs-f1.txt
Skipping: Accelerometer-2011-06-02-10-36-42-descend_stairs-f1.txt
Skipping: Accelerometer-2011-05-30-10-19-56-descend_stairs-m1.txt
Skipping: Accelerometer-2011-05-31-15-00-30-descend_stairs-f1.txt
Skipping: Accelerometer-2011-05-30-20-56-43-descend_stairs-f1.txt
Skipping: Accelerometer-2011-05-30-08-24-58-descend_stairs-f1.txt
Skipping: Accelerometer-2011-05-30-21-53-35-descend_stairs-m2.txt
Skipping: Accelerometer-2011-06-06-10-58-14-descend_stairs-f1.txt
Skipping: Accelerometer-2011-06-02-10-36-04-descend_stairs-f1.txt
Skipping: Accelerometer-2011-06-06-11-01-54-descend_stairs-f1.txt
Skipping: Accelerometer-2011-05-30-21-32-18-descend_stairs-m2.txt
Skipping: Accelerometer-2011-04-11-11-51-27-descend_stairs-f1.txt
Skipping: Accelerometer-2011-05-30-08-34-06-descend_stairs-f1.txt
Skipping: Accelerometer-2011-03-24-10-24-02-descend_stairs-f1.txt
Skipping: Accelerometer-2011-06-02-10-38-15-descend_stairs-f1.txt
Skipping: Accelerometer-2011-05-30-09-31-43-descend_stairs-f1.txt
Skipping: Accelerometer-2011-05-31-16-28-22-descend_stairs-f1.txt
Skipping: Accelerometer-2011-05-30-09-29-15-descend_stairs-f1.txt
Skipping: Accelerometer-2011-03-29-16-17-18-descend_stairs-f1.txt
Skipping: Accelerometer-2011-06-06-10-56-55-descend_stairs-f1.txt
Skipping: Accelerometer-2011-05-30-21-39-11-descend_stairs-m2.txt
Skipping: Accelerometer-2011-06-06-10-59-38-descend_stairs-f1.txt
Skipping: Accelerometer-2011-03-29-16-17-50-descend_stairs-f1.txt
Skipping: Accelerometer-2011-05-30-08-20-55-descend_stairs-f1.txt
Skipping: Accelerometer-2011-06-06-10-58-40-descend_stairs-f1.txt
Skipping: Accelerometer-2011-05-31-14-52-31-descend_stairs-f1.txt
Skipping: Accelerometer-2011-05-30-21-09-46-descend_stairs-f1.txt
Skipping: Accelerometer-2011-05-30-09-40-50-descend_stairs-f1.txt
Skipping: Accelerometer-2011-03-24-10-25-11-descend_stairs-f1.txt
Skipping: Accelerometer-2011-06-06-11-00-26-descend_stairs-f1.txt
Skipping: Accelerometer-2011-06-06-10-56-23-descend_stairs-f1.txt
Skipping: Accelerometer-2011-06-02-10-38-52-descend_stairs-f1.txt
Skipping: Accelerometer-2011-05-30-10-24-51-descend_stairs-m1.txt
Skipping: Accelerometer-2011-05-30-20-48-10-descend_stairs-f1.txt
Skipping: Accelerometer-2011-05-31-15-15-48-descend_stairs-f1.txt
Skipping: Accelerometer-2011-05-30-10-37-30-descend_stairs-m1.txt
Skipping: Accelerometer-2011-04-11-13-32-24-descend_stairs-f1.txt
Skipping: Accelerometer-2011-03-29-16-18-14-descend_stairs-f1.txt
Skipping: Accelerometer-2011-03-29-09-15-58-descend_stairs-f1.txt
Skipping: Accelerometer-2011-05-31-16-21-49-descend_stairs-f1.txt
Skipping: Accelerometer-2011-04-05-18-26-06-descend_stairs-f1.txt
Skipping: Accelerometer-2011-03-29-16-16-34-descend_stairs-f1.txt
Skipping: Accelerometer-2012-06-06-09-45-03-walk-m6.txt
Skipping: Accelerometer-2011-04-11-11-55-57-walk-f1.txt
Skipping: Accelerometer-2011-05-30-20-51-03-walk-f1.txt
Skipping: Accelerometer-2012-06-06-08-57-26-walk-m5.txt
Skipping: Accelerometer-2012-06-06-09-07-30-walk-m5.txt
Skipping: Accelerometer-2012-06-06-14-10-02-walk-m7.txt
Skipping: Accelerometer-2012-06-06-09-36-06-walk-m6.txt
Skipping: Accelerometer-2012-06-06-09-45-38-walk-m6.txt
Skipping: Accelerometer-2012-06-06-14-11-30-walk-m7.txt
Skipping: Accelerometer-2012-06-07-10-57-45-walk-f1.txt
Skipping: Accelerometer-2011-05-30-21-39-55-walk-m2.txt
Skipping: Accelerometer-2012-05-30-18-29-02-walk-f3.txt
Skipping: Accelerometer-2012-06-07-10-52-46-walk-f1.txt
Skipping: Accelerometer-2012-06-06-14-15-57-walk-m7.txt
Skipping: Accelerometer-2012-05-29-17-18-55-walk-m3.txt

Skipping: Accelerometer-2011-05-30-21-44-35-walk-m2.txt
Skipping: Accelerometer-2011-05-30-09-35-03-walk-f1.txt
Skipping: Accelerometer-2012-06-06-09-46-31-walk-m6.txt
Skipping: Accelerometer-2011-03-29-16-16-01-walk-f1.txt
Skipping: Accelerometer-2011-05-31-16-32-12-walk-f1.txt
Skipping: Accelerometer-2012-06-06-14-06-10-walk-m7.txt
Skipping: Accelerometer-2012-05-29-16-51-40-walk-f2.txt
Skipping: Accelerometer-2012-06-07-10-52-14-walk-f1.txt
Skipping: Accelerometer-2012-06-06-09-47-07-walk-m6.txt
Skipping: Accelerometer-2012-05-30-22-02-42-walk-m2.txt
Skipping: Accelerometer-2012-05-30-22-03-03-walk-m2.txt
Skipping: Accelerometer-2011-05-31-16-23-32-walk-f1.txt
Skipping: Accelerometer-2012-06-07-10-50-09-walk-f1.txt
Skipping: Accelerometer-2012-05-30-22-03-27-walk-m2.txt
Skipping: Accelerometer-2012-05-30-22-03-52-walk-m2.txt
Skipping: Accelerometer-2011-03-24-10-58-34-walk-f1.txt
Skipping: Accelerometer-2012-06-06-08-59-00-walk-m5.txt
Skipping: Accelerometer-2011-05-31-15-05-44-walk-f1.txt
Skipping: Accelerometer-2012-06-06-14-12-00-walk-m7.txt
Skipping: Accelerometer-2011-05-31-14-54-41-walk-f1.txt
Skipping: Accelerometer-2012-05-29-17-15-15-walk-m3.txt
Skipping: Accelerometer-2012-05-29-16-45-30-walk-f2.txt
Skipping: Accelerometer-2012-05-30-22-04-20-walk-m2.txt
Skipping: Accelerometer-2012-06-06-14-14-27-walk-m7.txt
Skipping: Accelerometer-2012-06-11-11-39-29-walk-m1.txt
Skipping: Accelerometer-2012-06-06-09-09-21-walk-m5.txt
Skipping: Accelerometer-2012-06-06-14-15-25-walk-m7.txt
Skipping: Accelerometer-2012-06-06-09-42-05-walk-m6.txt
Skipping: Accelerometer-2011-04-05-18-30-57-walk-f1.txt
Skipping: Accelerometer-2012-06-11-11-30-57-walk-m1.txt
Skipping: Accelerometer-2012-06-06-09-04-41-walk-m5.txt
Skipping: Accelerometer-2012-06-06-09-02-54-walk-m5.txt
Skipping: Accelerometer-2012-06-11-11-37-36-walk-m1.txt
Skipping: Accelerometer-2011-03-24-11-21-13-walk-f1.txt
Skipping: Accelerometer-2012-05-29-17-13-45-walk-m3.txt
Skipping: Accelerometer-2012-06-11-11-31-42-walk-m1.txt
Accelerometer-2011-05-30-21-01-39-walk-f1.txt
Skipping: Accelerometer-2012-06-11-11-32-28-walk-m1.txt
Skipping: Accelerometer-2011-05-30-10-29-28-walk-m1.txt
Skipping: Accelerometer-2011-05-31-15-01-05-walk-f1.txt
Skipping: Accelerometer-2012-06-07-10-55-33-walk-f1.txt
Skipping: Accelerometer-2012-05-30-18-28-32-walk-f3.txt
Skipping: Accelerometer-2012-05-30-18-29-35-walk-f3.txt
Skipping: Accelerometer-2012-05-30-19-11-27-walk-m4.txt
Skipping: Accelerometer-2012-05-30-19-09-54-walk-m4.txt
Skipping: Accelerometer-2012-06-06-08-58-20-walk-m5.txt
Skipping: Accelerometer-2012-06-06-09-41-32-walk-m6.txt
Skipping: Accelerometer-2012-06-06-09-39-47-walk-m6.txt
Skipping: Accelerometer-2012-06-11-11-36-25-walk-m1.txt
Skipping: Accelerometer-2012-06-06-09-35-07-walk-m6.txt
Skipping: Accelerometer-2012-06-07-10-57-12-walk-f1.txt
Skipping: Accelerometer-2012-06-06-09-10-02-walk-m5.txt
Skipping: Accelerometer-2012-06-11-11-23-05-walk-m1.txt
Skipping: Accelerometer-2012-05-29-16-51-03-walk-f2.txt
Skipping: Accelerometer-2011-03-24-09-51-07-walk-f1.txt
Skipping: Accelerometer-2012-06-11-11-33-42-walk-m1.txt
Skipping: Accelerometer-2012-06-06-08-56-33-walk-m5.txt
Skipping: Accelerometer-2012-06-06-09-34-20-walk-m6.txt
Skipping: Accelerometer-2012-05-30-18-30-08-walk-f3.txt

Skipping: Accelerometer-2012-06-06-09-36-38-walk-m6.txt
 Skipping: Accelerometer-2012-06-06-09-40-33-walk-m6.txt
 Skipping: Accelerometer-2012-06-06-14-10-33-walk-m7.txt
 Skipping: Accelerometer-2012-05-29-17-16-24-walk-m3.txt
 Skipping: Accelerometer-2012-06-06-14-13-56-walk-m7.txt
 Skipping: Accelerometer-2012-06-06-09-02-06-walk-m5.txt
 Skipping: Accelerometer-2012-05-30-19-10-27-walk-m4.txt
 Skipping: Accelerometer-2012-06-11-11-37-01-walk-m1.txt
 Skipping: Accelerometer-2012-06-06-14-06-43-walk-m7.txt
 Skipping: Accelerometer-2012-06-07-10-50-42-walk-f1.txt
 Skipping: Accelerometer-2011-05-30-08-29-07-walk-f1.txt
 Skipping: Accelerometer-2012-06-11-11-33-07-walk-m1.txt
 Skipping: Accelerometer-2011-03-24-11-20-24-walk-f1.txt
 Skipping: Accelerometer-2012-05-30-19-10-56-walk-m4.txt
 Skipping: Accelerometer-2012-06-06-09-08-19-walk-m5.txt
 Skipping: Accelerometer-2012-06-06-09-03-57-walk-m5.txt
 Skipping: Accelerometer-2012-06-11-11-38-12-walk-m1.txt
 Skipping: Accelerometer-2012-06-11-11-38-52-walk-m1.txt
 Skipping: Accelerometer-2011-05-31-16-28-55-walk-f1.txt
 Skipping: Accelerometer-2012-05-29-16-46-02-walk-f2.txt
 Skipping: Accelerometer-2012-06-06-14-07-41-walk-m7.txt
 Skipping: Accelerometer-2012-06-11-11-34-18-walk-m1.txt
 Skipping: Accelerometer-2011-03-24-09-52-11-walk-f1.txt
 Skipping: Accelerometer-2011-05-30-21-34-15-walk-m2.txt
 Skipping: Accelerometer-2011-05-30-20-57-19-walk-f1.txt
 Skipping: Accelerometer-2012-06-06-14-08-12-walk-m7.txt

Task B : Convert from CSV to PARQUET

CSV isn't a memory and storage efficient file format - the same holds for JSON by the way. Therefore, formats like [Avro](https://en.wikipedia.org/wiki/Apache_Avro?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01) ([https://en.wikipedia.org/wiki/Apache_Avro?](https://en.wikipedia.org/wiki/Apache_Avro?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01)[utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01](https://en.wikipedia.org/wiki/Apache_Avro?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01)), [Parquet](https://en.wikipedia.org/wiki/Apache_Parquet?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01) ([https://en.wikipedia.org/wiki/Apache_Parquet?](https://en.wikipedia.org/wiki/Apache_Parquet?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01)[utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01](https://en.wikipedia.org/wiki/Apache_Parquet?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01)), [ORC](https://en.wikipedia.org/wiki/Apache_ORC?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01) ([https://en.wikipedia.org/wiki/Apache_ORC?](https://en.wikipedia.org/wiki/Apache_ORC?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01)[utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01](https://en.wikipedia.org/wiki/Apache_ORC?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01)) or [RCFile](https://en.wikipedia.org/wiki/RCFile?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01) ([https://en.wikipedia.org/wiki/RCFile?](https://en.wikipedia.org/wiki/RCFile?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01)[utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01](https://en.wikipedia.org/wiki/RCFile?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01)) emerged. Therefore we convert the CSV data to PARQUET before uploading it to Cloud Object Store. Again, [CLAIMED](https://github.com/IBM/claimed/tree/master/component-library) (<https://github.com/IBM/claimed/tree/master/component-library>) provides a component as jupyter notebook exactly doing that. Please explore the notebook under *component-library/transform/spark-csv-to-parquet.ipynb*. You can either directly run the notebook or execute the following cell.

In [3]:

```
!ipython ./claimed/component-library/transform/spark-csv-to-parquet.ipynb data_dir=./data/
```

```
]0;IPython: labs/BD0231EN 37
```

```
Starting installation...
```

```
Please <<RESTART YOUR KERNEL>> (Kernel->Restart Kernel and Clear All Outputs)
```

```
WARNING:root:Parameter: data_dir="./data/"
```

Task C: Condense parquet file

As mentioned before - Apache Spark creates folders instead of files - in the folder, besides some status information, you will see that one sub-file per partition is written. This is handy for parallel processing but sometimes we want all data to be self-contained in a single file. Therefore, the "spark-condense-parquet.ipynb" component in the *./claimed/component-library/transform/* folder does this job. Let's execute it using the cell below, but please also open the notebook to see what it is doing - alternatively you can also run the notebook cell by cell.

In [4]:

```
!python ./claimed/component-library/transform/spark-condense-parquet.ipynb data_dir=./  
data/
```



```
]0;IPython: labs/BD0231EN 37
Starting installation...
Please <<RESTART YOUR KERNEL>> (Kernel->Restart Kernel and Clear All Outputs)
22/02/04 12:41:32 WARN util.NativeCodeLoader: Unable to load native-hadoop
library for your platform... using builtin-java classes where applicable
Setting default log level to "WARN".
To adjust logging level use sc.setLogLevel(newLevel). For SparkR, use setLogLevel(newLevel).
```

```
-----
-
Py4JJavaError                                Traceback (most recent call last)
~/conda/envs/python/lib/python3.7/site-packages/pyspark/sql/utils.py in deco(*a, **kw)
    62         try:
--> 63             return f(*a, **kw)
    64         except py4j.protocol.Py4JJavaError as e:

~/conda/envs/python/lib/python3.7/site-packages/py4j/protocol.py in get_return_value(answer, gateway_client, target_id, name)
    327         "An error occurred while calling {0}{1}{2}.\n"
.
--> 328             format(target_id, ".", name), value)
    329     else:
```

```
Py4JJavaError: An error occurred while calling o29.parquet.
: org.apache.spark.sql.AnalysisException: path file:/resources/labs/BD0231EN/data/data_condensed.parquet already exists.;
    at org.apache.spark.sql.execution.datasources.InsertIntoHadoopFsRelationCommand.run(InsertIntoHadoopFsRelationCommand.scala:114)
    at org.apache.spark.sql.execution.command.DataWritingCommandExecutionSideEffectResult$lzycompute(commands.scala:104)
    at org.apache.spark.sql.execution.command.DataWritingCommandExecutionSideEffectResult(commands.scala:102)
    at org.apache.spark.sql.execution.command.DataWritingCommandExecution.doExecute(commands.scala:122)
    at org.apache.spark.sql.execution.SparkPlan$$anonfun$execute$1.apply(SparkPlan.scala:131)
    at org.apache.spark.sql.execution.SparkPlan$$anonfun$execute$1.apply(SparkPlan.scala:127)
    at org.apache.spark.sql.execution.SparkPlan$$anonfun$executeQuery$1.apply(SparkPlan.scala:155)
    at org.apache.spark.rdd.RDDOperationScope$.withScope(RDDOperationScope.scala:151)
    at org.apache.spark.sql.execution.SparkPlan.executeQuery(SparkPlan.scala:152)
    at org.apache.spark.sql.execution.SparkPlan.execute(SparkPlan.scala:127)
    at org.apache.spark.sql.execution.QueryExecution.toRdd$lzycompute(QueryExecution.scala:80)
    at org.apache.spark.sql.execution.QueryExecution.toRdd(QueryExecution.scala:80)
    at org.apache.spark.sql.DataFrameWriter$$anonfun$runCommand$1.apply(DataFrameWriter.scala:676)
    at org.apache.spark.sql.DataFrameWriter$$anonfun$runCommand$1.apply(DataFrameWriter.scala:676)
    at org.apache.spark.sql.execution.SQLExecution$$anonfun$withNewExecutionId$1.apply(SQLExecution.scala:78)
```

```

    at org.apache.spark.sql.execution.SQLExecution$.withSQLConfPropagated(SQLExecution.scala:125)
    at org.apache.spark.sql.execution.SQLExecution$.withNewExecutionId(SQLExecution.scala:73)
    at org.apache.spark.sql.DataFrameWriter.runCommand(DataFrameWriter.scala:676)
    at org.apache.spark.sql.DataFrameWriter.saveToV1Source(DataFrameWriter.scala:285)
    at org.apache.spark.sql.DataFrameWriter.save(DataFrameWriter.scala:271)
    at org.apache.spark.sql.DataFrameWriter.save(DataFrameWriter.scala:229)
    at org.apache.spark.sql.DataFrameWriter.parquet(DataFrameWriter.scala:566)
    at sun.reflect.NativeMethodAccessorImpl.invoke0(Native Method)
    at sun.reflect.NativeMethodAccessorImpl.invoke(NativeMethodAccessorImpl.java:62)
    at sun.reflect.DelegatingMethodAccessorImpl.invoke(DelegatingMethodAccessorImpl.java:43)
    at java.lang.reflect.Method.invoke(Method.java:498)
    at py4j.reflection.MethodInvoker.invoke(MethodInvoker.java:244)
    at py4j.reflection.ReflectionEngine.invoke(ReflectionEngine.java:357)
    at py4j.Gateway.invoke(Gateway.java:282)
    at py4j.commands.AbstractCommand.invokeMethod(AbstractCommand.java:132)
    at py4j.commands.CallCommand.execute(CallCommand.java:79)
    at py4j.GatewayConnection.run(GatewayConnection.java:238)
    at java.lang.Thread.run(Thread.java:745)

```

During handling of the above exception, another exception occurred:

```

AnalysisException                                Traceback (most recent call last)
~/resources/labs/BD0231EN/claimed/component-library/transform/spark-condense-parquet.ipynb in <module>
----> 1 df.write.parquet(data_dir + data_parquet_condensed)

~/conda/envs/python/lib/python3.7/site-packages/pyspark/sql/readwriter.py
in parquet(self, path, mode, partitionBy, compression)
    845         self.partitionBy(partitionBy)
    846         self._set_opts(compression=compression)
--> 847         self._jwrite.parquet(path)
    848
    849         @since(1.6)

~/conda/envs/python/lib/python3.7/site-packages/py4j/java_gateway.py in __call__(self, *args)
    1255         answer = self.gateway_client.send_command(command)
    1256         return_value = get_return_value(
-> 1257             answer, self.gateway_client, self.target_id, self.name)
    1258
    1259         for temp_arg in temp_args:

~/conda/envs/python/lib/python3.7/site-packages/pyspark/sql/utils.py in deco(*a, **kw)
    67                                     e.java_exception.getS

```

```
tackTrace()))  
    68         if s.startswith('org.apache.spark.sql.AnalysisExceptio  
n: '):  
---> 69             raise AnalysisException(s.split(': ', 1)[1], stack  
Trace)  
    70         if s.startswith('org.apache.spark.sql.catalyst.analysi  
s'):  
    71             raise AnalysisException(s.split(': ', 1)[1], stack  
Trace)
```

AnalysisException: 'path file:/resources/labs/BD0231EN/data/data_condense
d.parquet already exists.;

Task D : Obtain access to Cloud Object Store

1. Please create an account on [IBM Cloud \(https://cloud.ibm.com/?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_campaign=SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01\)](https://cloud.ibm.com/?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_campaign=SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01) - it is free, doesn't expire and no credit card is required. You also get 25 GB storage on Cloud Object Store (COS) for free. IBM COS is compatible to S3. So what you learn here will work on all S3 compliant storage system in different clouds and also in your local data center.
2. Once you create and verify your account you can create an S3 compliant Object Storage service by clicking the following [link \(https://cloud.ibm.com/objectstorage/create?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_campaign=SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01\)](https://cloud.ibm.com/objectstorage/create?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_campaign=SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01) - please select the lite plan as it includes 25 GB of free storage

IBM Cloud

Search resources and offerings...

Catalog Docs Support Manage

Romeo Kienzler...

Catalog / Services /

Cloud Object Storage

Author: IBM • Date of last update: 2021-03-25 9:59 PM • Docs • API docs

Create About

Select a pricing plan

Displayed prices do not include tax. Monthly prices shown are for country or region: United States

Plan	Features	Pricing
Lite	<p>1 COS Service Instance</p> <p>Storage up to 25 GB/month</p> <p>Up to 2,000 Class A (PUT, COPY, POST, and LIST) requests per month</p> <p>Up to 20,000 Class B (GET and all others) requests per month</p> <p>Up to 10 GB/month of Data Retrieval</p> <p>Up to 5GB of egress (Public Outbound)</p> <p>Applies to aggregate total across all storage bucket classes</p>	Free
Standard	There is no minimum fee, so you pay only for what you use.	

View storage class pricing

Summary

Cloud Object Storage Free

Region: Global

Plan: Lite

Service name: Cloud Object Storage-f8

Resource group: default

Create

Add to estimate

View terms

1. You can always go back to the service created by accessing the [IBM Cloud Service Resource List \(https://cloud.ibm.com/resources?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_campaign=SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01\)](https://cloud.ibm.com/resources?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_campaign=SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01). Just look for an entry in the table under the "Storage" category and click on it.

IBM Cloud

Search resources and offerings...

Catalog Docs Support Manage

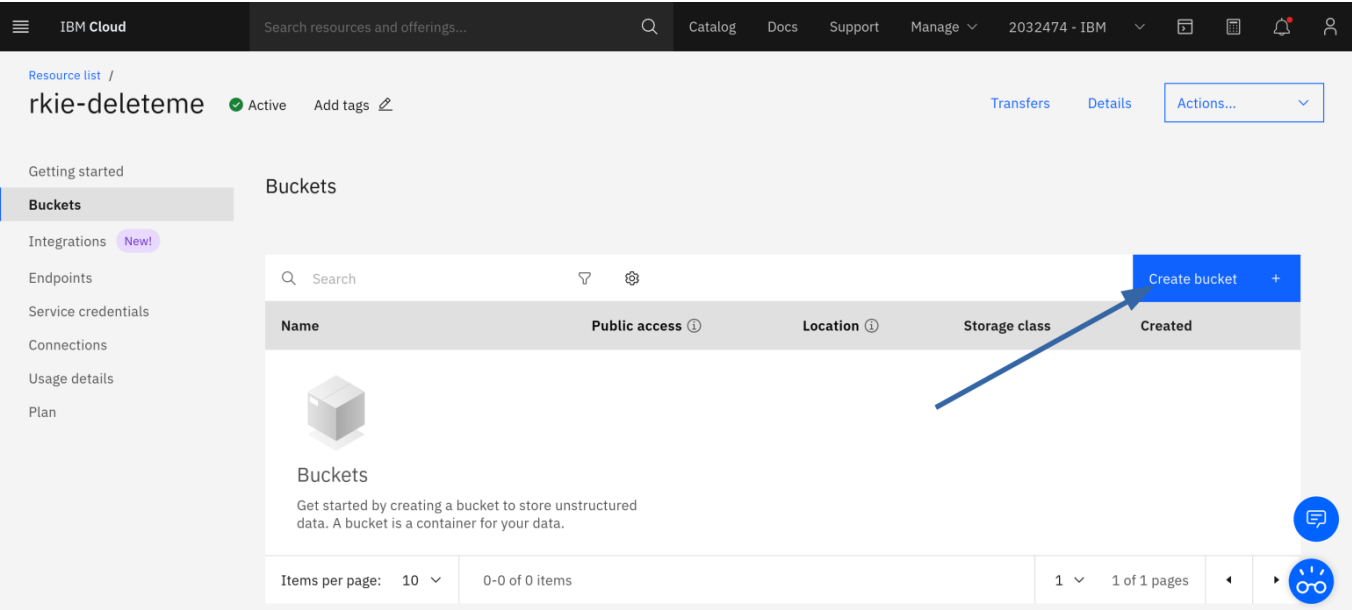
2032474 - IBM

Resource list

Create resource +

Name	Group	Location	Status	Tags
rkie-delete				
Devices (0 / 0)				
VPC infrastructure (0+ / 100+)				
Clusters (0 / 37)				
Satellite (0 / 0)				
Cloud Foundry apps (0 / 2)				
Cloud Foundry services (0 / 3)				
Services and software (0+ / 100+)				
Storage (1 / 374)				
rkie-deleteme	prod	Global	Active	-

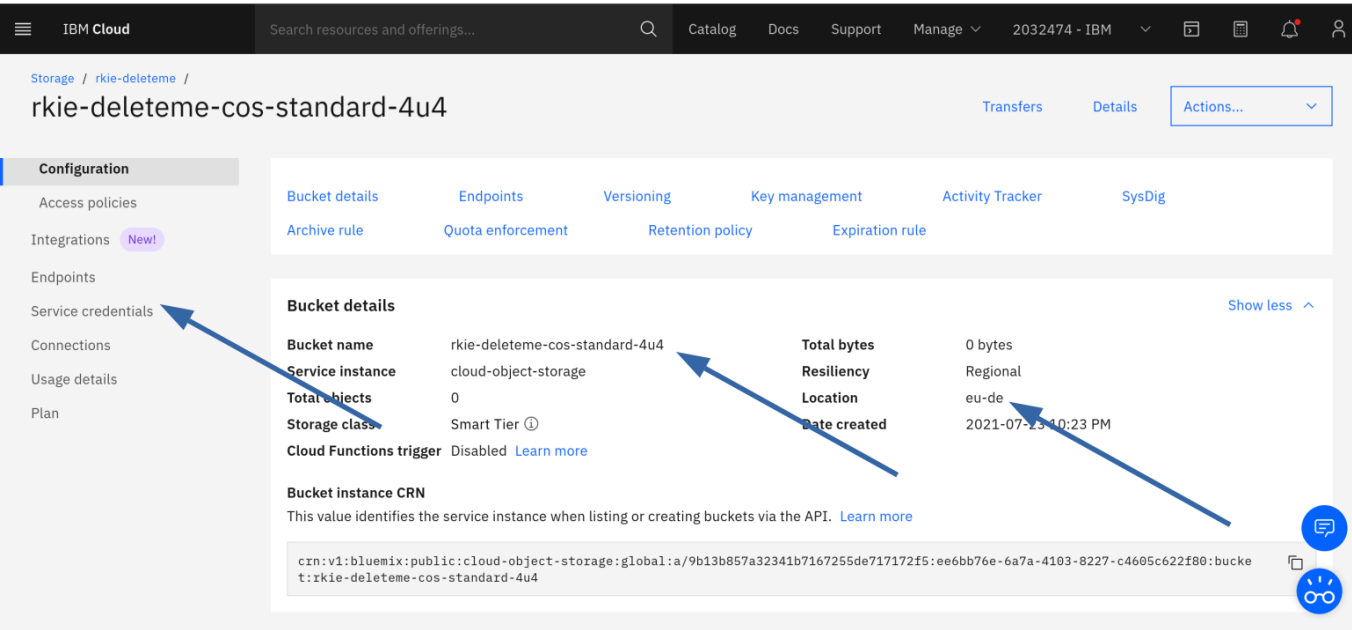
1. Now please click "Create Bucket"



1. Select the "Quickly get started" option by clicking the arrow



1. Click on "next" twice, then click "View Bucket Configuration"
2. Here, please note the bucket name, and the location, then click "Service Credentials"



1. Click on "New Credential", then under "Advanced Options", please ensure that "Include HMAC Credential" is active. Then click "Add"


Create credential ✕

[Advanced options](#) ^

Select Service ID (Optional) ⓘ

Auto Generate ▾

Include HMAC Credential ⓘ

☒ On 

Provide service-specific configuration parameters in a valid JSON object (Optional)

Choose file

Add inline configuration parameters (Optional)

Cancel Add

1. Please open the newly created credentials, an in the "cos_hmac_keys" section, please note down "access_key_id" and "secret_access_key"

Search credentials...

New credential

<div><div></div><div></div></div>	Key name	Date created	
<div><div></div><div></div></div>	rkie-deleteme-cos-standard-4u4	2021-07-23 10:23 PM	<div></div>
<div><div></div><div></div></div>	Service credentials-1	2021-07-23 11:00 PM	<div></div>
	<pre>{ "apikey": "0ZnSzjmuDekQDMuF_K0vmNxq9vKtTZDm8RB16r417gpC", "cos_hmac_keys": { "access_key_id": "4a29bfecdc14697bf8de8befa6829c9", "secret_access_key": "1c36b1141645a2065bf8a201e704ce9ce307a66972764403" }, "endpoints": "https://control.cloud-object-storage.cloud.ibm.com/v2/endpoints", "iam_apikey_description": "Auto-generated for key 4a29bfec-edc1-4697-bf8d-e8befa6829c9", "iam_apikey_name": "Service credentials-1",</pre>		

1. Click on "Endpoints", then select the appropriate location you've obtained four steps before. That way the correct public endpoint is displayed, please note it somewhere for future use.

Congratulations! You've obtained all information to store your data to Cloud Object Storage

Task E: Upload file to Cloud Object Storage

Now it's time to use the data you've gathered from task B and fill in the following variables in the next cell. Then please run the cell. This will upload the parquet file you've created to Cloud Object Store where it is stored at the lowest possible cost and made available to others.

Please note: The endpoint you need to set is not the "endpoints" from the service credentials section but from Task D Step 11

Note :After executing the below code, if you get an error as:

```
ERROR: pip's dependency resolver does not currently take into account all the packages that are installed.
```

This behaviour is the source of the following dependency conflicts. aiobotocore 1.4.1 requires botocore<1.20.107,>=1.20.106, but you have botocore 1.10.62 which is incompatible.

Kindly ignore the error and proceed to **TaskF**. Your file will be deployed.

In [5]:

```
%%bash
export access_key_id='access_key_id=<your_access_key_id_goes_here>'
export secret_access_key='secret_access_key=<your_secret_access_key_goes_here>'
export endpoint='endpoint=https://<your_endpoint_goes_here>'
export bucket_name='bucket_name=<your_cos_bucket_name_goes_here>'
export source_file='source_file=data_condensed.parquet'
export destination_file='destination_file=data.parquet'
export data_dir='data_dir=./data/'
ipython ./claimed/component-library/output/upload-to-cos.ipynb $access_key_id $secret_a
ccess_key $endpoint $bucket_name $source_file $destination_file $data_dir
```



```

]0;IPython: labs/BD0231EN Collecting aiobotocore==1.4.1
  Downloading aiobotocore-1.4.1.tar.gz (52 kB)
  Preparing metadata (setup.py): started
  Preparing metadata (setup.py): finished with status 'done'
Collecting botocore<1.20.107,>=1.20.106
  Downloading botocore-1.20.106-py2.py3-none-any.whl (7.7 MB)
Collecting aiohttp>=3.3.1
  Downloading aiohttp-3.8.1-cp37-cp37m-manylinux_2_5_x86_64.manylinux1_x86_64.manylinux_2_12_x86_64.manylinux2010_x86_64.whl (1.1 MB)
Requirement already satisfied: wrapt>=1.10.10 in /home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from aiobotocore==1.4.1) (1.13.3)
Collecting aioitertools>=0.5.1
  Downloading aioitertools-0.8.0-py3-none-any.whl (21 kB)
Collecting multidict<7.0,>=4.5
  Downloading multidict-6.0.2-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (94 kB)
Requirement already satisfied: typing-extensions>=3.7.4 in /home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from aiohttp>=3.3.1->aiobotocore==1.4.1) (4.0.1)
Collecting yarl<2.0,>=1.0
  Downloading yarl-1.7.2-cp37-cp37m-manylinux_2_5_x86_64.manylinux1_x86_64.manylinux_2_12_x86_64.manylinux2010_x86_64.whl (271 kB)
Requirement already satisfied: charset-normalizer<3.0,>=2.0 in /home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from aiohttp>=3.3.1->aiobotocore==1.4.1) (2.0.8)
Collecting aiosignal>=1.1.2
  Downloading aiosignal-1.2.0-py3-none-any.whl (8.2 kB)
Collecting frozenlist>=1.1.1
  Downloading frozenlist-1.3.0-cp37-cp37m-manylinux_2_5_x86_64.manylinux1_x86_64.manylinux_2_17_x86_64.manylinux2014_x86_64.whl (144 kB)
Requirement already satisfied: attrs>=17.3.0 in /home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from aiohttp>=3.3.1->aiobotocore==1.4.1) (21.2.0)
Collecting async-timeout<5.0,>=4.0.0a3
  Downloading async_timeout-4.0.2-py3-none-any.whl (5.8 kB)
Collecting asyncctest==0.13.0
  Downloading asyncctest-0.13.0-py3-none-any.whl (26 kB)
Requirement already satisfied: jmespath<1.0.0,>=0.7.1 in /home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from botocore<1.20.107,>=1.20.106->aiobotocore==1.4.1) (0.10.0)
Requirement already satisfied: urllib3<1.27,>=1.25.4 in /home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from botocore<1.20.107,>=1.20.106->aiobotocore==1.4.1) (1.26.7)
Requirement already satisfied: python-dateutil<3.0.0,>=2.1 in /home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from botocore<1.20.107,>=1.20.106->aiobotocore==1.4.1) (2.8.2)
Requirement already satisfied: six>=1.5 in /home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from python-dateutil<3.0.0,>=2.1->botocore<1.20.107,>=1.20.106->aiobotocore==1.4.1) (1.16.0)
Requirement already satisfied: idna>=2.0 in /home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from yarl<2.0,>=1.0->aiohttp>=3.3.1->aiobotocore==1.4.1) (3.1)
Building wheels for collected packages: aiobotocore
  Building wheel for aiobotocore (setup.py): started
  Building wheel for aiobotocore (setup.py): finished with status 'done'
  Created wheel for aiobotocore: filename=aiobotocore-1.4.1-py3-none-any.whl size=49840 sha256=ac69f0de4538fc0548ce0165fe658aeaece247e7fecbe82eabd8a0f352d8816b
  Stored in directory: /home/jupyterlab/.cache/pip/wheels/25/3a/78/e9b2629

```

d550d1598aa7f95648277711ca46aeb6ae846b90c69

Successfully built aiobotocore

Installing collected packages: multidict, frozenlist, yarl, asyncctest, async-timeout, aiosignal, botocore, aioitertools, aiohttp, aiobotocore

Attempting uninstall: botocore

Found existing installation: botocore 1.10.84

Uninstalling botocore-1.10.84:

Successfully uninstalled botocore-1.10.84

Successfully installed aiobotocore-1.4.1 aiohttp-3.8.1 aioitertools-0.8.0 aiosignal-1.2.0 async-timeout-4.0.2 asyncctest-0.13.0 botocore-1.20.106 frozenlist-1.3.0 multidict-6.0.2 yarl-1.7.2

Collecting botocore==1.10.62

Downloading botocore-1.10.62-py2.py3-none-any.whl (4.4 MB)

Requirement already satisfied: jmespath<1.0.0,>=0.7.1 in /home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from botocore==1.10.62) (0.10.0)

Requirement already satisfied: docutils>=0.10 in /home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from botocore==1.10.62) (0.18.1)

Requirement already satisfied: python-dateutil<3.0.0,>=2.1 in /home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from botocore==1.10.62) (2.8.2)

Requirement already satisfied: six>=1.5 in /home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from python-dateutil<3.0.0,>=2.1->botocore==1.10.62) (1.16.0)

Installing collected packages: botocore

Attempting uninstall: botocore

Found existing installation: botocore 1.20.106

Uninstalling botocore-1.20.106:

Successfully uninstalled botocore-1.20.106

Successfully installed botocore-1.10.62

Collecting s3fs==2021.11.0

Downloading s3fs-2021.11.0-py3-none-any.whl (25 kB)

Requirement already satisfied: aiohttp>=3.7.1 in /home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from s3fs==2021.11.0) (3.8.1)

Collecting fsspec==2021.11.0

Downloading fsspec-2021.11.0-py3-none-any.whl (132 kB)

Requirement already satisfied: aiobotocore~=1.4.1 in /home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from s3fs==2021.11.0) (1.4.1)

Requirement already satisfied: wrapt>=1.10.10 in /home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from aiobotocore~=1.4.1->s3fs==2021.11.0) (1.13.3)

Collecting botocore<1.20.107,>=1.20.106

Using cached botocore-1.20.106-py2.py3-none-any.whl (7.7 MB)

Requirement already satisfied: aioitertools>=0.5.1 in /home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from aiobotocore~=1.4.1->s3fs==2021.11.0) (0.8.0)

Requirement already satisfied: multidict<7.0,>=4.5 in /home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from aiohttp>=3.7.1->s3fs==2021.11.0) (6.0.2)

Requirement already satisfied: typing-extensions>=3.7.4 in /home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from aiohttp>=3.7.1->s3fs==2021.11.0) (4.0.1)

Requirement already satisfied: yarl<2.0,>=1.0 in /home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from aiohttp>=3.7.1->s3fs==2021.11.0) (1.7.2)

Requirement already satisfied: charset-normalizer<3.0,>=2.0 in /home/jupyterlab/conda/envs/python/lib/python3.7/site-packages (from aiohttp>=3.7.1->s3fs==2021.11.0) (2.0.8)

Requirement already satisfied: aiosignal>=1.1.2 in /home/jupyterlab/conda/

```

envs/python/lib/python3.7/site-packages (from aiohttp>=3.7.1->s3fs==2021.1
1.0) (1.2.0)
Requirement already satisfied: frozenlist>=1.1.1 in /home/jupyterlab/conda
a/envs/python/lib/python3.7/site-packages (from aiohttp>=3.7.1->s3fs==202
1.11.0) (1.3.0)
Requirement already satisfied: attrs>=17.3.0 in /home/jupyterlab/conda/env
s/python/lib/python3.7/site-packages (from aiohttp>=3.7.1->s3fs==2021.11.
0) (21.2.0)
Requirement already satisfied: async-timeout<5.0,>=4.0.0a3 in /home/jupyte
rlab/conda/envs/python/lib/python3.7/site-packages (from aiohttp>=3.7.1->s
3fs==2021.11.0) (4.0.2)
Requirement already satisfied: asyncctest==0.13.0 in /home/jupyterlab/conda
a/envs/python/lib/python3.7/site-packages (from aiohttp>=3.7.1->s3fs==202
1.11.0) (0.13.0)
Requirement already satisfied: jmespath<1.0.0,>=0.7.1 in /home/jupyterlab/
conda/envs/python/lib/python3.7/site-packages (from botocore<1.20.107,>=1.
20.106->aibotocore~=1.4.1->s3fs==2021.11.0) (0.10.0)
Requirement already satisfied: urllib3<1.27,>=1.25.4 in /home/jupyterlab/c
onda/envs/python/lib/python3.7/site-packages (from botocore<1.20.107,>=1.2
0.106->aibotocore~=1.4.1->s3fs==2021.11.0) (1.26.7)
Requirement already satisfied: python-dateutil<3.0.0,>=2.1 in /home/jupyte
rlab/conda/envs/python/lib/python3.7/site-packages (from botocore<1.20.10
7,>=1.20.106->aibotocore~=1.4.1->s3fs==2021.11.0) (2.8.2)
Requirement already satisfied: idna>=2.0 in /home/jupyterlab/conda/envs/py
thon/lib/python3.7/site-packages (from yarl<2.0,>=1.0->aiohttp>=3.7.1->s3f
s==2021.11.0) (3.1)
Requirement already satisfied: six>=1.5 in /home/jupyterlab/conda/envs/pyt
hon/lib/python3.7/site-packages (from python-dateutil<3.0.0,>=2.1->botocor
e<1.20.107,>=1.20.106->aibotocore~=1.4.1->s3fs==2021.11.0) (1.16.0)
Installing collected packages: botocore, fsspec, s3fs
  Attempting uninstall: botocore
    Found existing installation: botocore 1.10.62
    Uninstalling botocore-1.10.62:
      Successfully uninstalled botocore-1.10.62
  Attempting uninstall: fsspec
    Found existing installation: fsspec 2021.11.1
    Uninstalling fsspec-2021.11.1:
      Successfully uninstalled fsspec-2021.11.1
Successfully installed botocore-1.20.106 fsspec-2021.11.0 s3fs-2021.11.0

```

```

-----
ValueError                                Traceback (most recent call las
t)
~/resources/labs/BD0231EN/claimed/component-library/output/upload-to-cos.ip
ynb in <module>
----> 1 s3.put(data_dir + source_file, bucket_name + '/' + destination_fil
e)

~/conda/envs/python/lib/python3.7/site-packages/fsspec/async.py in wrapper
(*args, **kwargs)
    89     def wrapper(*args, **kwargs):
    90         self = obj or args[0]
----> 91         return sync(self.loop, func, *args, **kwargs)
    92
    93     return wrapper

~/conda/envs/python/lib/python3.7/site-packages/fsspec/async.py in sync(loop, func, timeout, *args, **kwargs)
    69     raise FSTimeoutError from return_result

```

```

70     elif isinstance(return_result, BaseException):
---> 71         raise return_result
72     else:
73         return return_result

~/conda/envs/python/lib/python3.7/site-packages/fsspec/asyn.py in _runner
(event, coro, result, timeout)
    23         coro = asyncio.wait_for(coro, timeout=timeout)
    24     try:
---> 25         result[0] = await coro
    26     except Exception as ex:
    27         result[0] = ex

~/conda/envs/python/lib/python3.7/site-packages/fsspec/asyn.py in _put(self,
lpath, rpath, recursive, callback, **kwargs)
    403         lpaths = fs.expand_path(lpath, recursive=recursive)
    404         rpaths = other_paths(
--> 405             lpaths, rpath, exists=isinstance(rpath, str) and await
self._isdir(rpath)
    406         )
    407

~/conda/envs/python/lib/python3.7/site-packages/s3fs/core.py in _isdir(self,
path)
    1126         # This only returns things within the path and NOT the pat
h object itself
    1127         try:
-> 1128             return bool(await self._lsdir(path))
    1129         except FileNotFoundError:
    1130             return False

~/conda/envs/python/lib/python3.7/site-packages/s3fs/core.py in _lsdir(self,
path, refresh, max_items, delimiter, prefix)
    563         try:
    564             logger.debug("Get directory listing page for %s" %
path)
--> 565             await self.set_session()
    566             s3 = await self.get_s3(bucket)
    567             pag = s3.get_paginator("list_objects_v2")

~/conda/envs/python/lib/python3.7/site-packages/s3fs/core.py in set_sessio
n(self, refresh, kwargs)
    407         "s3", config=conf, **init_kwargs, **client_kwargs
    408     )
--> 409     self._s3 = await s3creator.__aenter__()
    410
    411     self._s3creator = s3creator

~/conda/envs/python/lib/python3.7/site-packages/aiobotocore/session.py in
__aenter__(self)
    35
    36     async def __aenter__(self) -> AioBaseClient:
---> 37         self._client = await self._coro
    38         return await self._client.__aenter__()
    39

~/conda/envs/python/lib/python3.7/site-packages/aiobotocore/session.py in
_create_client(self, service_name, region_name, api_version, use_ssl, veri
fy, endpoint_url, aws_access_key_id, aws_secret_access_key, aws_session_to

```

```

ken, config)
123         is_secure=use_ssl, endpoint_url=endpoint_url, verify=verify,
124         credentials=credentials, scoped_config=self.get_scoped
_config(),
--> 125         client_config=config, api_version=api_version)
126     monitor = self._get_internal_component('monitor')
127     if monitor is not None:

```

```

~/conda/envs/python/lib/python3.7/site-packages/aiobotocore/client.py in c
reate_client(self, service_name, region_name, is_secure, endpoint_url, ver
ify, credentials, scoped_config, api_version, client_config)
32         client_args = self._get_client_args(
33             service_model, region_name, is_secure, endpoint_url,
--> 34             verify, credentials, scoped_config, client_config, end
point_bridge)
35         service_client = cls(**client_args)
36         self._register_retries(service_client)

```

```

~/conda/envs/python/lib/python3.7/site-packages/aiobotocore/client.py in _
get_client_args(self, service_model, region_name, is_secure, endpoint_url,
verify, credentials, scoped_config, client_config, endpoint_bridge)
88         return args_creator.get_client_args(
89             service_model, region_name, is_secure, endpoint_url,
--> 90             verify, credentials, scoped_config, client_config, end
point_bridge)
91
92

```

```

~/conda/envs/python/lib/python3.7/site-packages/aiobotocore/args.py in get
_client_args(self, service_model, region_name, is_secure, endpoint_url, ve
rify, credentials, scoped_config, client_config, endpoint_bridge)
61         client_cert=new_config.client_cert,
62         proxies_config=new_config.proxies_config,
--> 63         connector_args=new_config.connector_args)
64
65         serializer = botocore.serialize.create_serializer(

```

```

~/conda/envs/python/lib/python3.7/site-packages/aiobotocore/endpoint.py in
create_endpoint(self, service_model, region_name, endpoint_url, verify, re
sponse_parser_factory, timeout, max_pool_connections, http_session_cls, pr
oxies, socket_options, client_cert, proxies_config, connector_args)
244         if not is_valid_endpoint_url(endpoint_url):
245
--> 246             raise ValueError("Invalid endpoint: %s" % endpoint_url
)
247
248         if proxies is None:
proxies = self._get_proxies(endpoint_url)

```

ValueError: Invalid endpoint: https://<your_endpoint_goes_here>

ERROR: pip's dependency resolver does not currently take into account all the packages that are installed. This behaviour is the source of the following dependency conflicts.

boto3 1.7.62 requires botocore<1.11.0,>=1.10.62, but you have botocore 1.20.106 which is incompatible.

ERROR: pip's dependency resolver does not currently take into account all the packages that are installed. This behaviour is the source of the following dependency conflicts.

aiobotocore 1.4.1 requires botocore<1.20.107,>=1.20.106, but you have botocore 1.10.62 which is incompatible.

ERROR: pip's dependency resolver does not currently take into account all the packages that are installed. This behaviour is the source of the following dependency conflicts.

boto3 1.7.62 requires botocore<1.11.0,>=1.10.62, but you have botocore 1.20.106 which is incompatible.

WARNING:root:Parameter: access_key_id="<your_access_key_id_goes_here>"

WARNING:root:Parameter: secret_access_key="<your_secret_access_key_goes_here>"

WARNING:root:Parameter: endpoint="https://<your_endpoint_goes_here>"

WARNING:root:Parameter: bucket_name="<your_cos_bucket_name_goes_here>"

WARNING:root:Parameter: source_file="data_condensed.parquet"

WARNING:root:Parameter: destination_file="data.parquet"

WARNING:root:Parameter: data_dir="./data/"

```

-----
-
CalledProcessError                                Traceback (most recent call las
t)
/tmp/ipykernel_2335/269878640.py in <module>
----> 1 get_ipython().run_cell_magic('bash', '', "export access_key_id='ac
cess_key_id=<your_access_key_id_goes_here>'\nexport secret_access_key='sec
ret_access_key=<your_secret_access_key_goes_here>'\nexport endpoint='endpo
int=https://<your_endpoint_goes_here>'\nexport bucket_name='bucket_name=<y
our_cos_bucket_name_goes_here>'\nexport source_file='source_file=data_cond
ensed.parquet'\nexport destination_file='destination_file=data.parquet'\ne
xport data_dir='data_dir=./data/'\nipython ./claimed/component-library/out
put/upload-to-cos.ipynb $access_key_id $secret_access_key $endpoint $bucke
t_name $source_file $destination_file $data_dir\n")

~/conda/envs/python/lib/python3.7/site-packages/IPython/core/interactivesh
ell.py in run_cell_magic(self, magic_name, line, cell)
    2417         with self.builtin_trap:
    2418             args = (magic_arg_s, cell)
-> 2419             result = fn(*args, **kwargs)
    2420         return result
    2421

~/conda/envs/python/lib/python3.7/site-packages/IPython/core/magics/scrip
t.py in named_script_magic(line, cell)
    140         else:
    141             line = script
--> 142             return self.shebang(line, cell)
    143
    144         # write a basic docstring:

~/conda/envs/python/lib/python3.7/site-packages/decorator.py in fun(*args,
**kw)
    230         if not kwsyntax:
    231             args, kw = fix(args, kw, sig)
--> 232         return caller(func, *(extras + args), **kw)
    233     fun.__name__ = func.__name__
    234     fun.__doc__ = func.__doc__

~/conda/envs/python/lib/python3.7/site-packages/IPython/core/magic.py in <
lambda>(f, *a, **k)
    185     # but it's overkill for just that one bit of state.
    186     def magic_deco(arg):
--> 187         call = lambda f, *a, **k: f(*a, **k)
    188
    189         if callable(arg):

~/conda/envs/python/lib/python3.7/site-packages/IPython/core/magics/scrip
t.py in shebang(self, line, cell)
    243         sys.stderr.flush()
    244         if args.raise_error and p.returncode!=0:
--> 245             raise CalledProcessError(p.returncode, cell, output=ou
t, stderr=err)
    246
    247     def _run_script(self, p, cell, to_close):

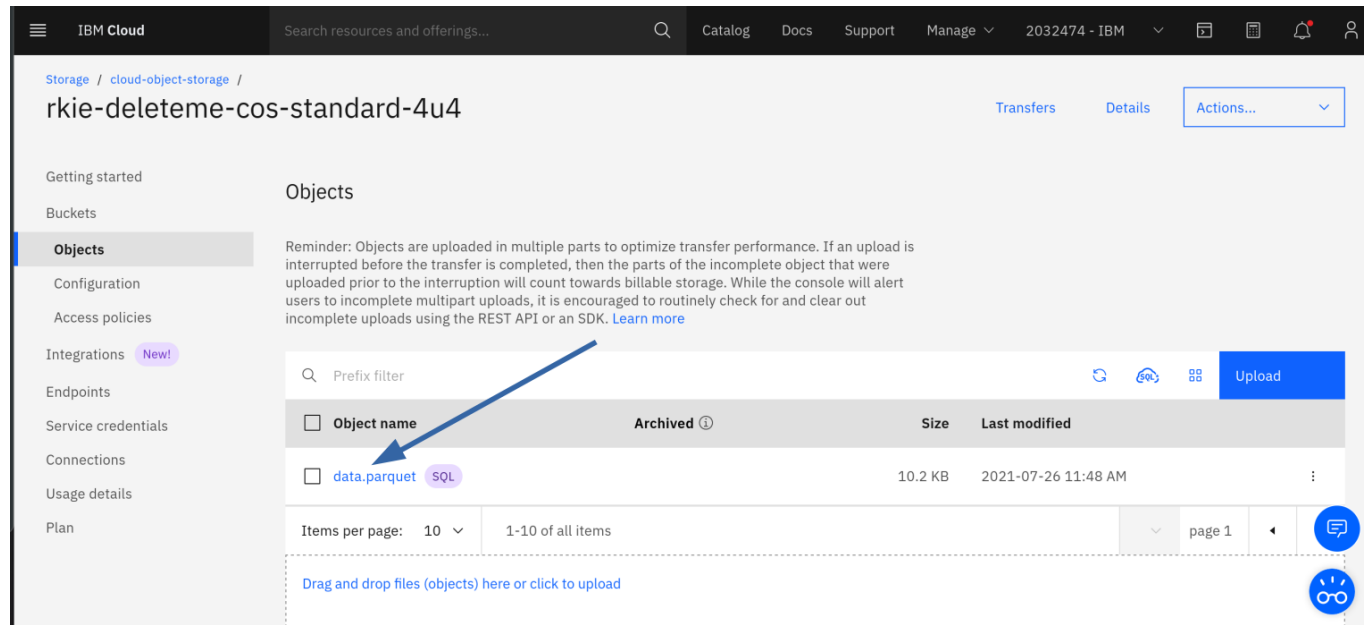
```

CalledProcessError: Command 'b"export access_key_id='access_key_id=<your_a
ccess_key_id_goes_here>'\nexport secret_access_key='secret_access_key=<you
r_secret_access_key_goes_here>'\nexport endpoint='endpoint=https://<your_e

```
ndpoint_goes_here>' \nexport bucket_name='bucket_name=<your_cos_bucket_name
_goes_here>' \nexport source_file='source_file=data_condensed.parquet' \nexp
ort destination_file='destination_file=data.parquet' \nexport data_dir='dat
a_dir=./data/' \npython ./claimed/component-library/output/upload-to-cos.i
py nb $access_key_id $secret_access_key $endpoint $bucket_name $source_file
$destination_file $data_dir\n"' returned non-zero exit status 1.
```

Task F: Double-check if the file arrived at its destination

To make sure everything worked as designed (actually an unnecessary step if you haven't received any errors) we open the IBM Cloud user interface. Please open the bucket contents as you've learned in Task C and check if the file arrived as shown below.



Congratulations, this concludes this lab.

Task F: (Optional) Pull another file and upload it as well to COS

To make things easier let's first flush the data dir:

In []:

```
!rm -Rf ./claimed/data/*
```

Now it's time for you to pull some other data set. You can choose anything you like but you can also use the "input-pardata.ipynb" notebook in folder "/component-library/input". This component pulls the JFK weather data set as data.csv. From there, please convert this CSV file to PARQUET, condense it and upload it to Object Storage as "jfk_data.parquet". You can either directly open the notebooks, run it inline this notebook below or even create a pipeline using the [Elyra Pipeline editor \(https://youtu.be/0SWRMnhIZMA?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01&t=1810\)](https://youtu.be/0SWRMnhIZMA?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01&t=1810).

We have provided an inline solution for you below in case you get stuck.



In []:

```
!ipython ./claimed/component-library/input/input-pardata.ipynb data_dir=./data/
```

In []:

```
!ipython ./claimed/component-library/transform/spark-csv-to-parquet.ipynb data_dir=./data/
```

In []:

```
!ipython ./claimed/component-library/transform/spark-condense-parquet.ipynb data_dir=./data/
```

In []:

```
%%bash
export access_key_id='access_key_id=<your_access_key_id_goes_here>'
export secret_access_key='secret_access_key=<your_secret_access_key_goes_here>'
export endpoint='endpoint=https://<your_endpoint_goes_here>'
export bucket_name='bucket_name=<your_cos_bucket_name_goes_here>'
export source_file='source_file=data_condensed.parquet'
export destination_file='destination_file=jfk_data.parquet'
export data_dir='data_dir=./data/'
ipython ./claimed/component-library/output/upload-to-cos.ipynb $access_key_id $secret_access_key $endpoint $bucket_name $source_file $destination_file $data_dir
```

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[utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01](https://ibm.com/?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01))

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[utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01](https://ibm.com/?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id:SkillsNetwork-Channel-SkillsNetworkCoursesIBMBD0231ENSkillsNetwork26766988-2021-01-01))

Changelog

Date	Version	Changed by	Change Description
2021-05-12	0.1	Romeo Kienzler	Initial version created
2021-06-22	1.0	Karthik Muthuraman	First editorial pass
2021-05-12	1.1	Romeo Kienzler	Adjusted for API changes
2021-05-26	1.2	Romeo Kienzler	Moved to jupyter lab
2021-05-26	1.3	Romeo Kienzler	Add optional task
2021-12-06	1.4	Lakshmi Holla	Added the warning note

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