

## Communication With End-Users by The Blaze Abaters

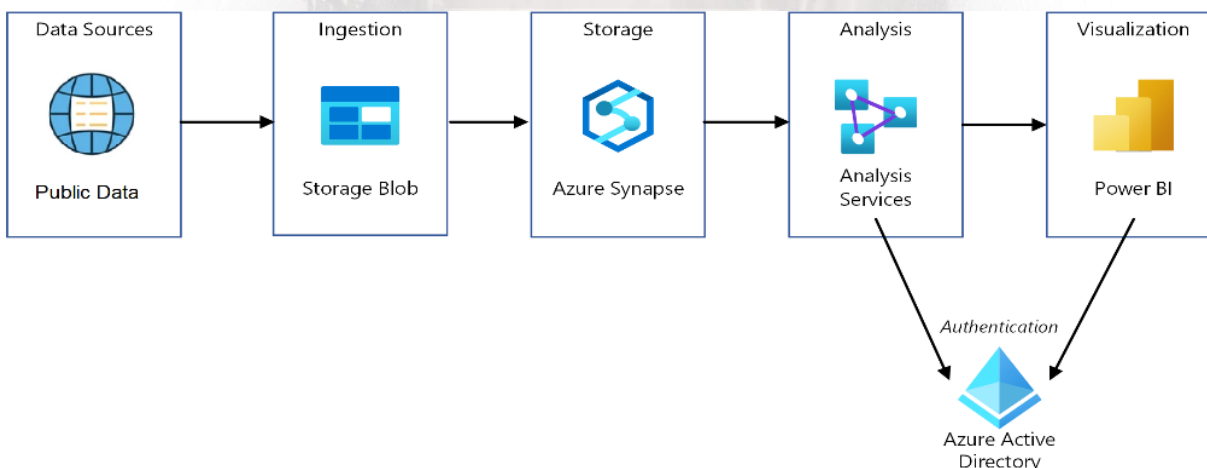
One of the most important problems when it comes to fighting fires is effectively communicating to end users the data necessary to make decisions and execute action plans. For this reason, we have created a data warehouse that collects the information in real time and organizes that information in a database for its later use in the prediction models and finally shows the findings in a dashboard accessible from any device with Internet connection.

In this document we will first explain the technology used to create the Data Warehouse, its architecture, and visualization of the findings in a dashboard and then we will explain the displayed values.

### I. Data Warehouse

In order to store, transform and visualize the data, we have created a Data Warehouse (DW) using Microsoft Azure. This DW is built with a robust infrastructure that allows for easy scalability, with which it will be possible to work with hundreds of thousands of data, even millions, in an automated way (that is, using automated pipelines). That means that the dashboard updates by itself instantly and shows the information for each month that has already completed (e.g. at the time of writing this document, the last month shown is April 2023).

The DW architecture is as follows:



The DW has automated pipelines which extract the data from public repositories and files (raw data), then some cleaning methodologies are applied to obtain a new dataset which will be used by ML models and visualized through a Power BI dashboard. Also, data security is managed by Azure Active Directory, that assure only auth users access to the Main Dashboard.

## II. Dashboard using Power BI

This dashboard is linked with an Azure data warehouse, so it is automatically capable of displaying insights from machine learning models.

The dashboard contains 2 pages:

- Dashboard and,
- Future Research.

In addition, each page contains a bookmark that, when is clicked, opens a website that shows an interactive heat map for each region (Denver and Columbus) with the number of occurrences for each one. Also, we consider that the dashboard and its charts are intuitive, using a standard color palette, with maroon (#700000) for Denver values and gray (#BCB9B9) for Columbus values.

### 1. Dashboard

This page contains 6 graphs and 2 cards that show an exploratory data analysis (EDA) of the main characteristics collected and used by the data models to generate predictions.

In addition to the graphs, there are 2 filters: one is to select the Columbus and Denver regions and other is to select the years. It is possible to select a single element, several or all at the same time. Whenever a single selection or combination of items is made, the data loaded in the charts and cards is filtered.

The 6 graphs displayed on the dashboard are the following:

- Occurrences by Month:** shows the average number of occurrences for each month, with a different line for each region.
- Brightness and Confidence by Month:** Displays the average brightness and confidence by month based on the selected region(s).
- Soil Moisture vs Surface Temp:** Shows the net values of each variable for each region.
- Average Temperature °F:** Shows the averages of minimum, maximum and temperature values, in °F, of the selected regions and years.
- Average Feels Like °F:** Shows the averages of minimum feels like, maximum feels like and feels like, in °F, for the selected regions and years.
- Humidity by Region:** This graph has a detail: in addition to showing the % humidity for each region, when the mouse is hover over the graph, we can see the % relative humidity, as well as the averages of Dew, Dust and Wind Velocity for the selected region.

On the other hand, the 2 graphs show the % of Cloud Cover and Visibility.

### 2. Future Research

Page 2 contains 5 possible lines of future research, as well as 2 scatter graphs considering the data of the Moonpahse vs Brightness and Humidity vs Transpire variables, respectively, for each region.