



HURRICANE PROCESSOR

ARCHITECTURAL DIAGRAMS



HURRICANE PROCESSOR

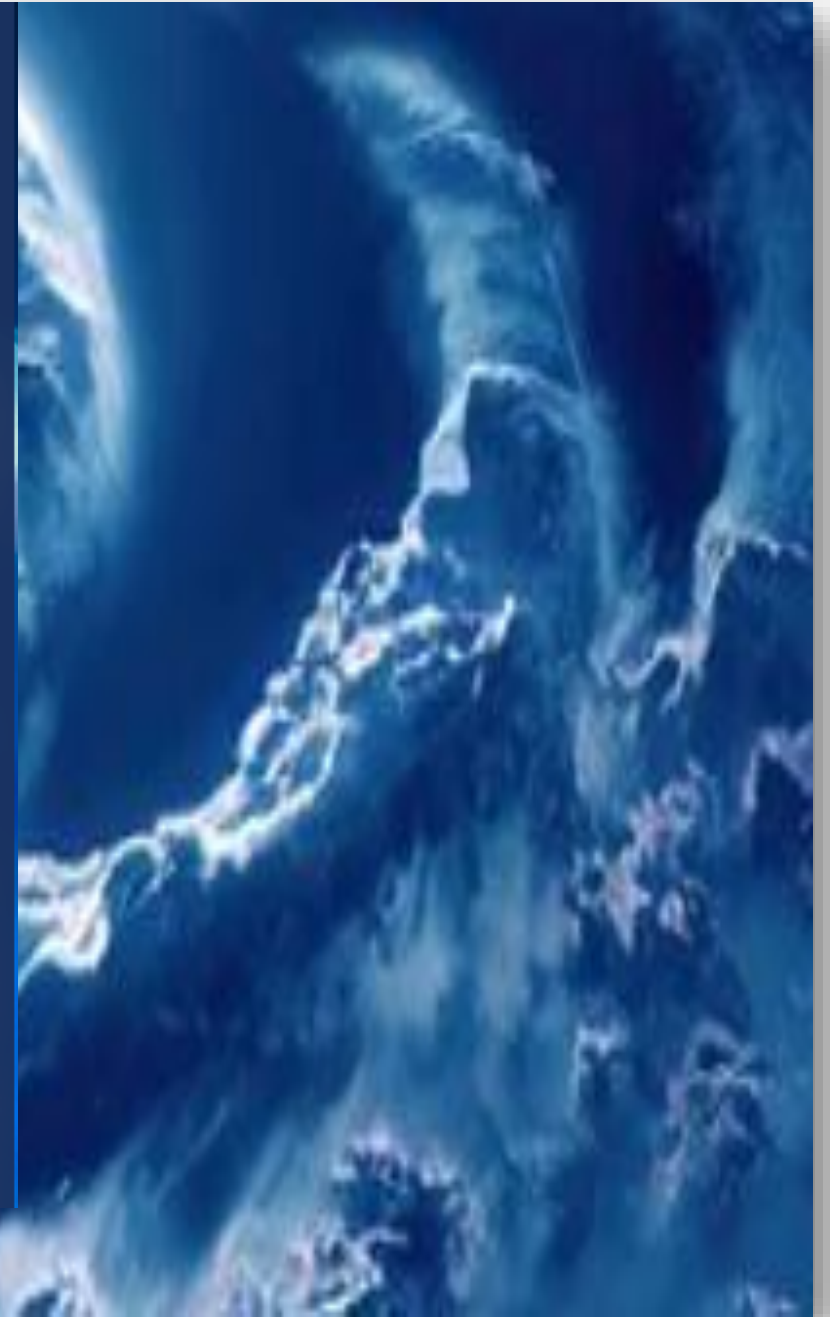


The diagram illustrates the Hurricane Processor architecture. It features a vertical sequence of three components, each represented by a white circle on the left and a horizontal teal bar on the right. The components are connected by a thin teal line. The first component is labeled '.NET 8 project', the second 'Front end: console application', and the third 'Back end: SQL Server database provider'.

.NET 8 project

Front end: console application

Back end: SQL Server database provider



HURRICANE PROCESSOR

Imports and transforms Atlantic Hurricane Database file provided by National Hurricane Center

Retrieves hurricane event location from the API or Geojson file based on the latitude/longitude

Creates Excel report with hurricanes that landed in the certain US state(s) and displays it to the user



APPLICATION'S DETAILED FEATURES

Caching transformed hurricane data into CSV file

Saving hurricanes into the database

Reading hurricanes from either HURDAT2 or the CSV file



APPLICATION'S DETAILED FEATURES

Retrieving hurricane addresses from either Online/Offline APIs or GeoJson file

Saving hurricane addresses into the database and CSV file

Reading hurricane addresses from either API or CSV/GeoJson files



APPLICATION'S DETAILED FEATURES

Retrieving hurricane report data from either the database or CSV files

Producing report file based on the input source without overriding reports from previous sources

Optionally displaying report to the user



HURRICANE PROCESSOR

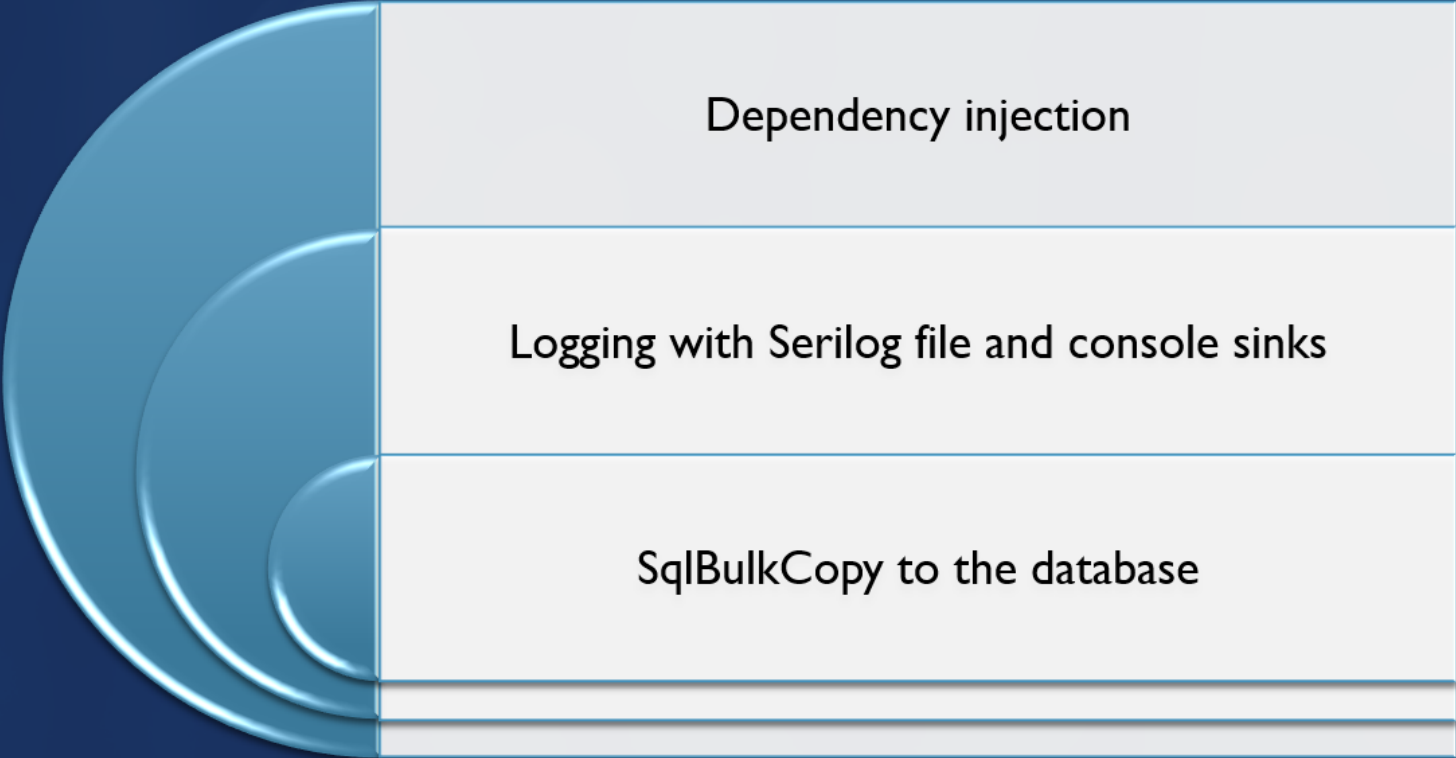



Diagram illustrating the components of the Hurricane Processor:

- Dependency injection
- Logging with Serilog file and console sinks
- SqlBulkCopy to the database

The diagram features a large, stylized blue hurricane icon on the left side of a light gray rectangular box. The box is divided into three horizontal sections, each containing a text label. The top section is labeled 'Dependency injection', the middle section is labeled 'Logging with Serilog file and console sinks', and the bottom section is labeled 'SqlBulkCopy to the database'. The entire diagram is set against a dark blue background.

ADDITIONAL APPLICATION DETAILS



Third party API usage for geoaddress reverse location (Nominatim and Wibci)
Third party package was utilized for Excel report creation (EPPlus)
Database storage is optional

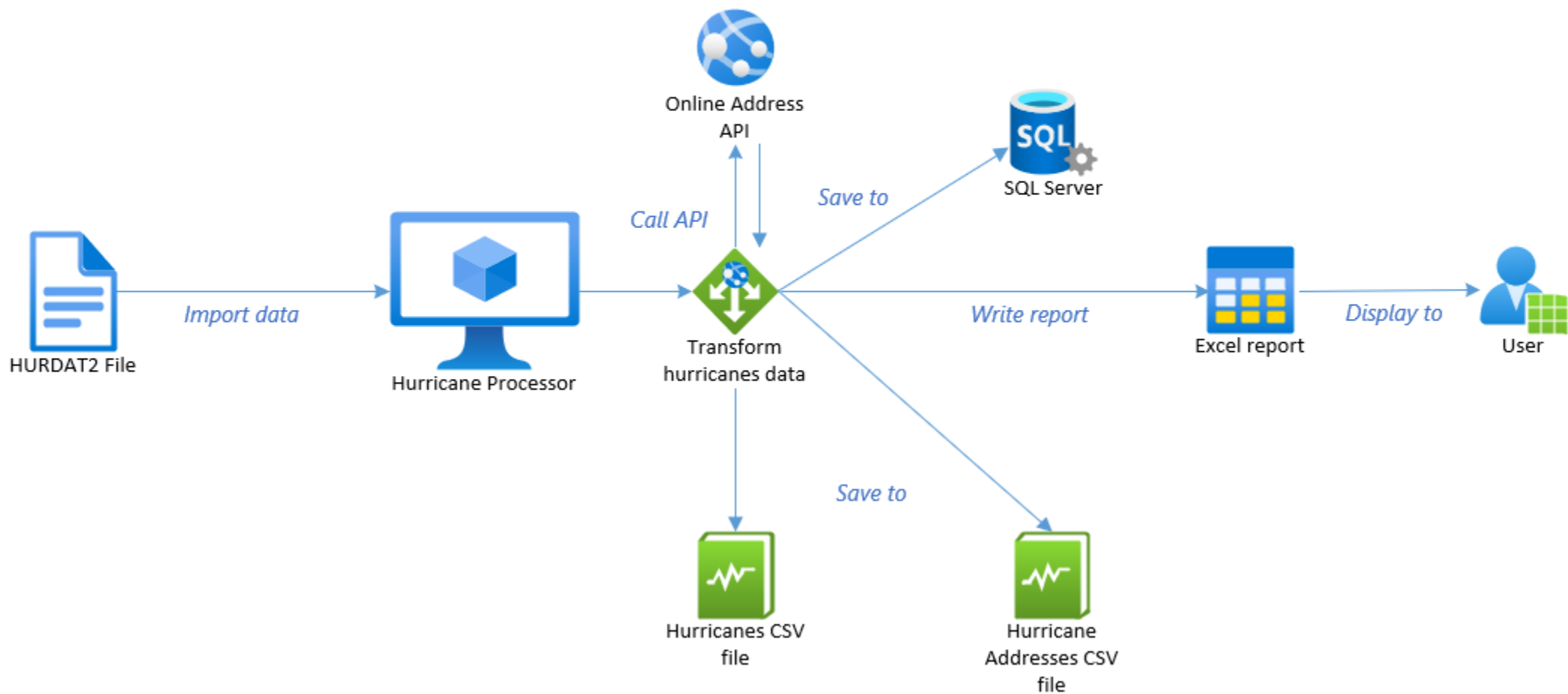
APPLICATION MAIN WORKFLOWS





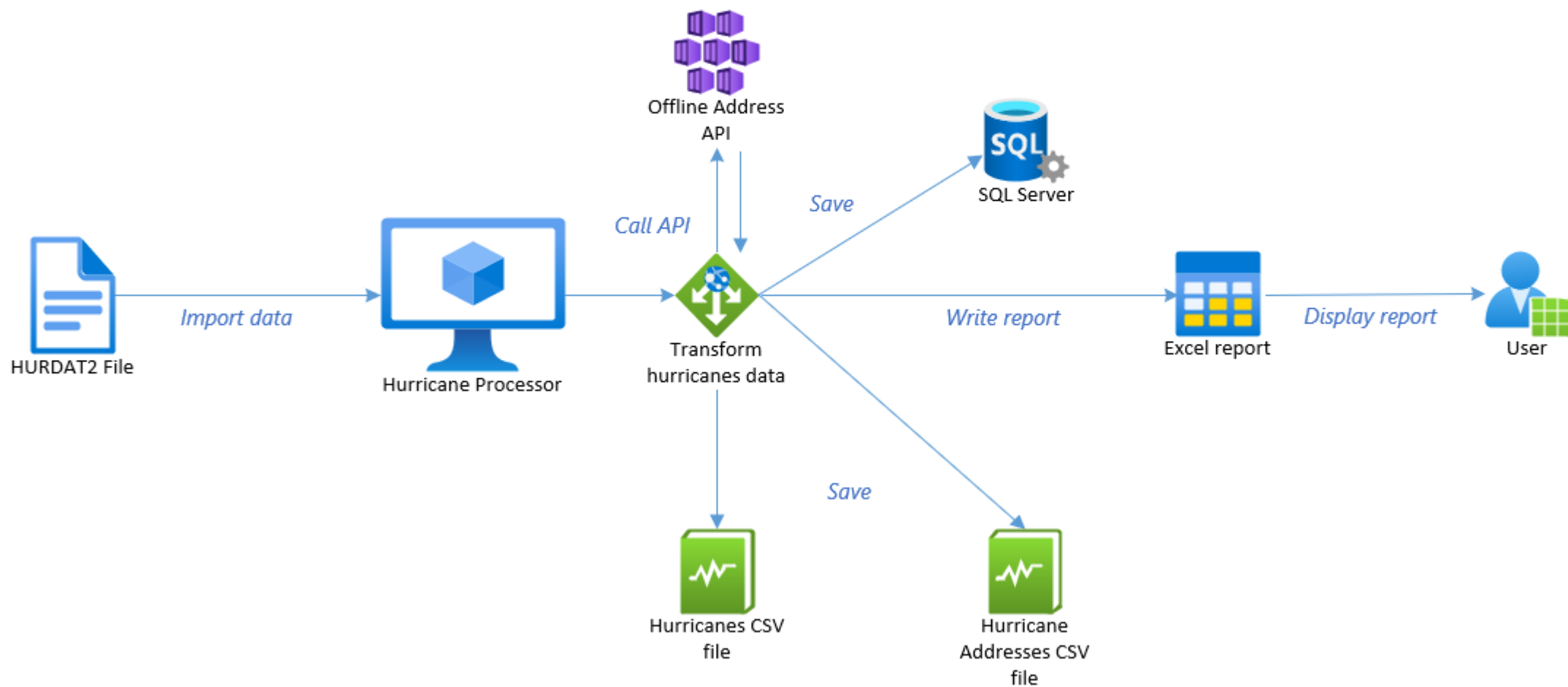
Workflow

Initial hurricane import with online API addresses and data caching to CSV files and database





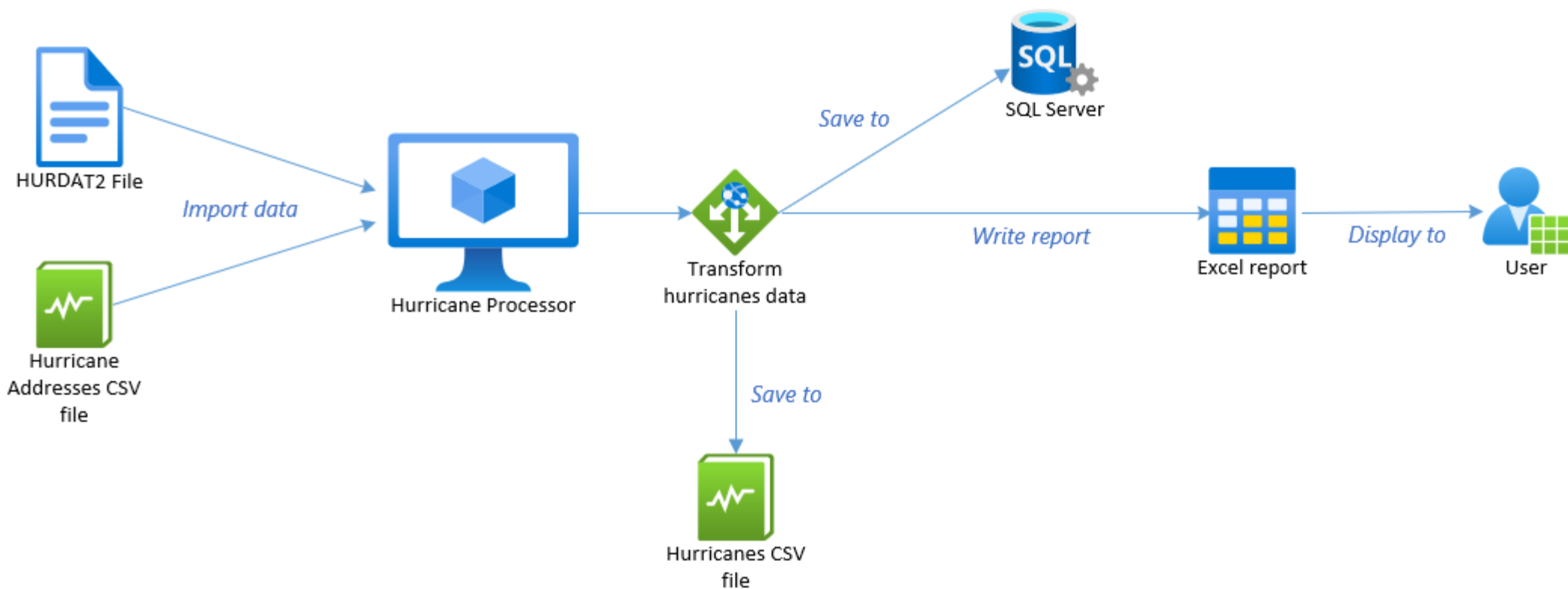
Initial hurricane import with offline API addresses and data caching to CSV files and database





Workflow

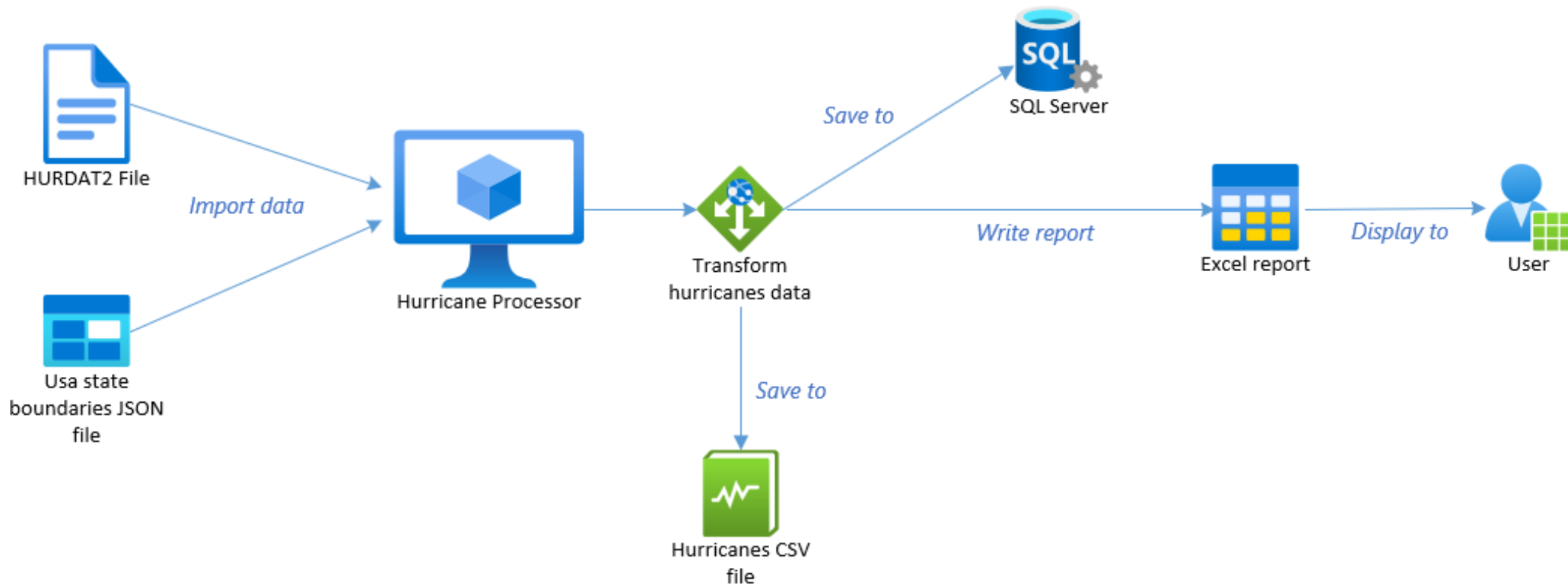
Initial hurricane import with cached addresses and data persistence to CSV file and database





Workflow

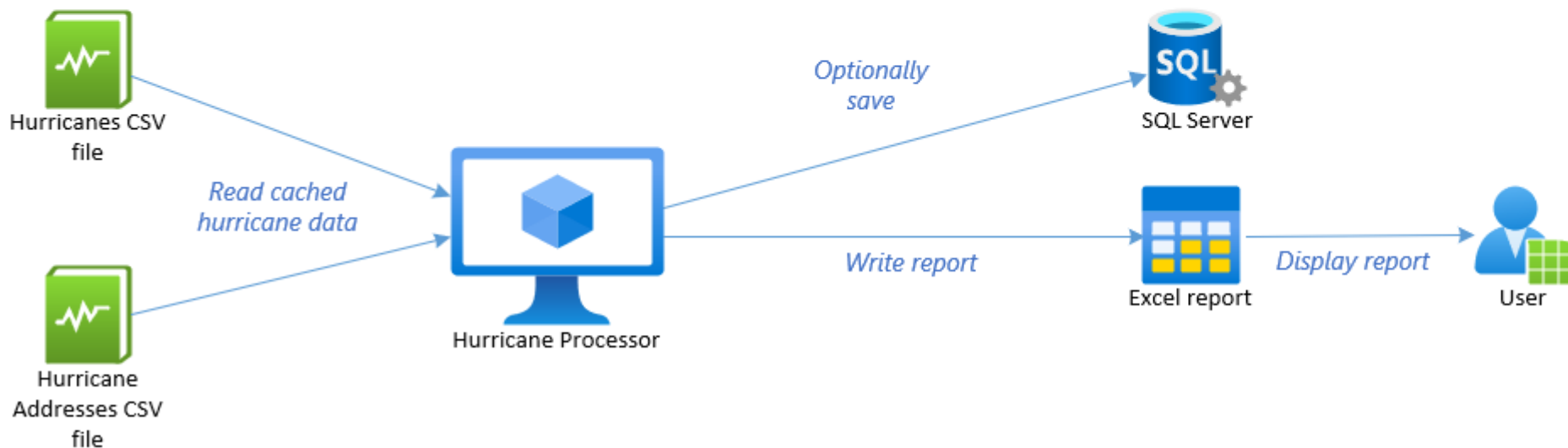
Initial hurricane import with JSON addresses and data persistence to CSV file and database





Workflow

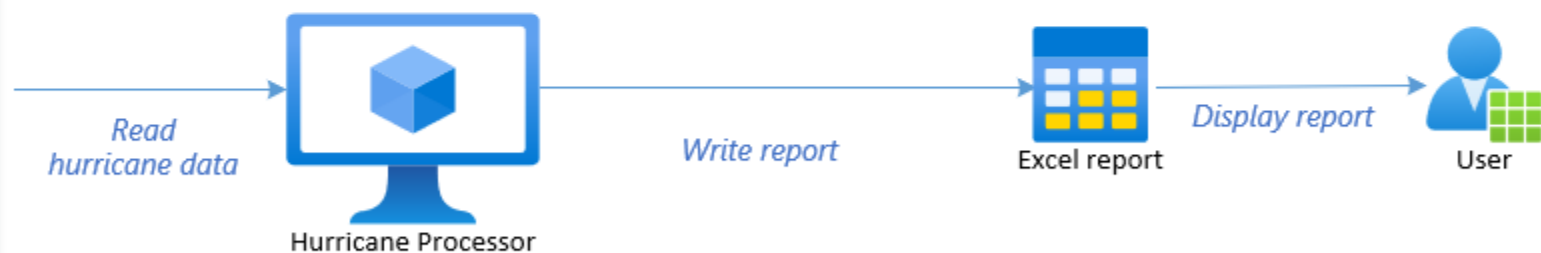
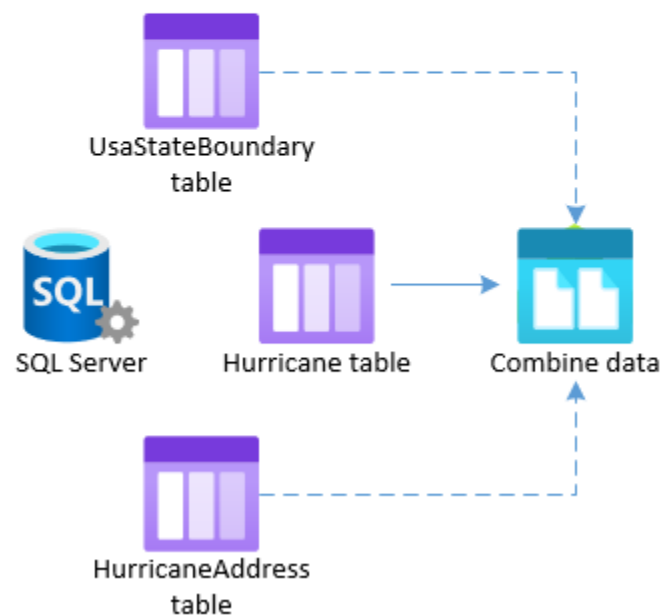
Use cached hurricanes and their addresses to produce Excel report and optionally save data to database





Workflow

Read hurricanes and their addresses from database to produce Excel report

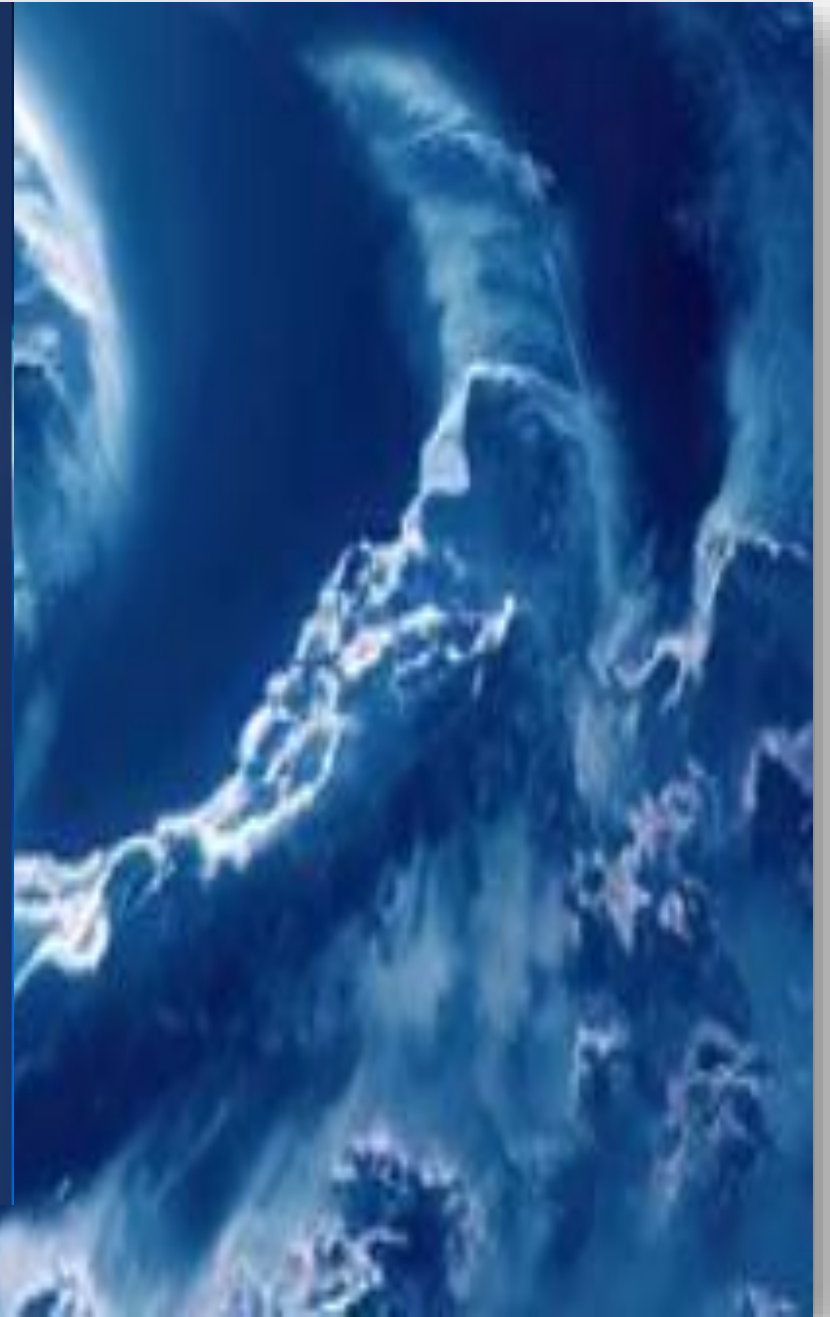


APPLICATION COMPONENTS

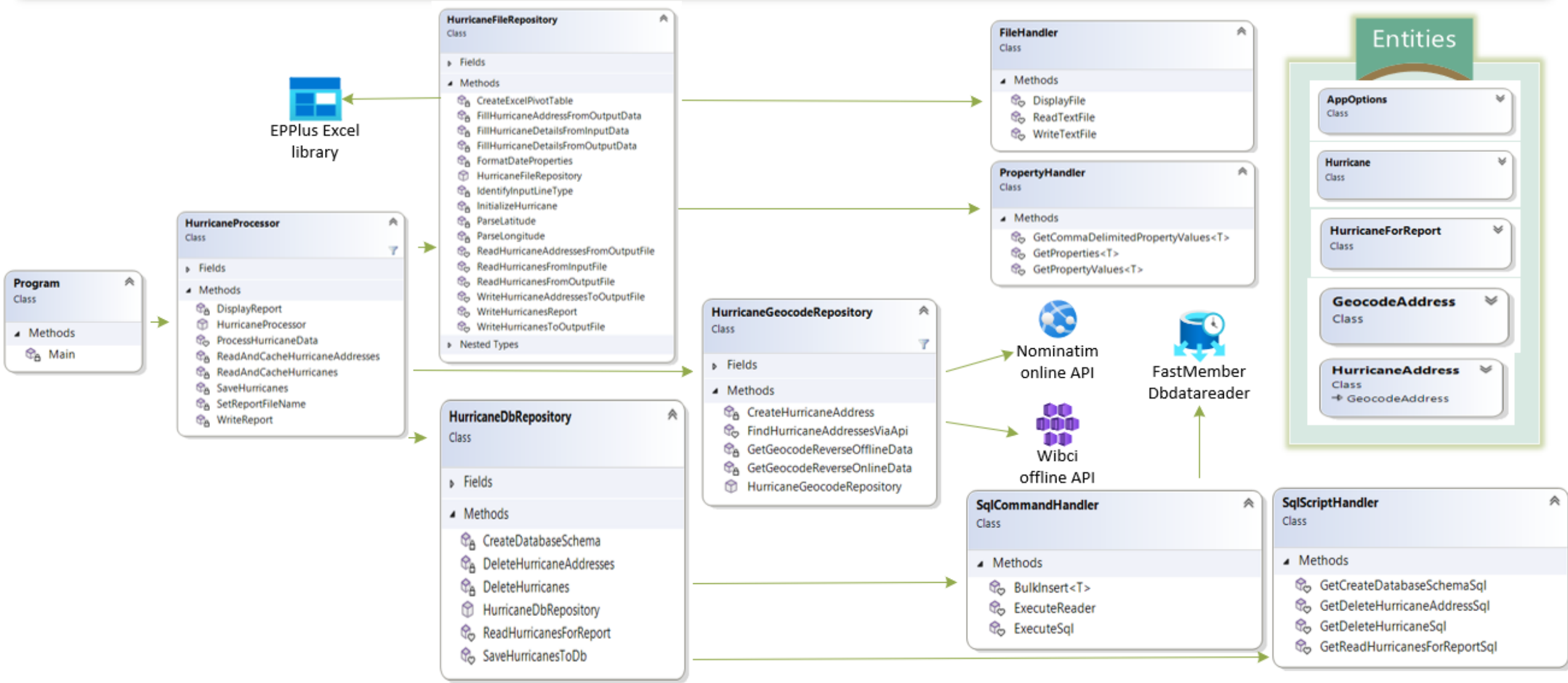
Project classes and third
party libraries

Data files

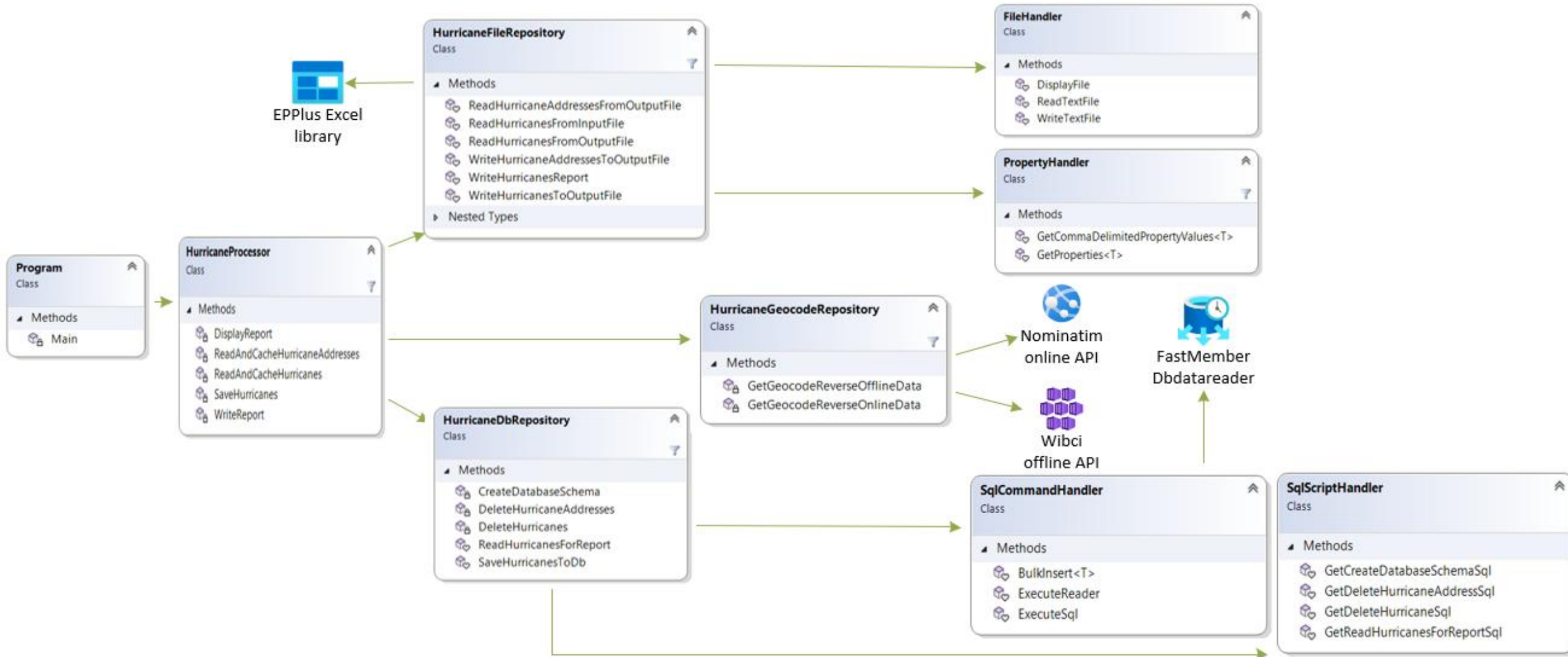
Database tables



Application class diagram: Functional classes



Application class diagram: Functional class key methods





Hurricane
Processor

Application class diagram: Entities

Entities

AppOptions

Class

Hurricane

Class

HurricaneForReport

Class

GeocodeAddress

Class

HurricaneAddress

Class

→ GeocodeAddress

Hurricane

Class

Properties

- AtcfCycloneNumberForThatYear
- Basin
- Day
- HeaderId
- HoursUTC
- Id
- Latitude
- Longitude
- MaximumSustainedWindInKnots
- MinimumPressureInMillibars
- MinutesUTC
- Month
- Name
- NumberOfBestTrackEntries
- RecordIdentifier
- RecordIdentifierDesc
- StatusOfSystem
- StatusOfSystemDesc
- WindRadii34KtMaxNortheast
- WindRadii34KtMaxNorthwest
- WindRadii34KtMaxSoutheast
- WindRadii34KtMaxSouthwest
- WindRadii50KtMaxNortheast
- WindRadii50KtMaxNorthwest
- WindRadii50KtMaxSoutheast
- WindRadii50KtMaxSouthwest
- WindRadii64KtMaxNortheast
- WindRadii64KtMaxNorthwest
- WindRadii64KtMaxSoutheast
- WindRadii64KtMaxSouthwest
- Year

HurricaneForReport

Class

Properties

- Date
- Latitude
- Longitude
- MaxWindSpeedInKnots
- MaxWindSpeedInKPH
- Name
- State

GeocodeAddress

Class

Properties

- City
- Country
- CountryCode
- County
- HouseNumber
- PostCode
- State
- Town
- Village

HurricaneAddress

Class

→ GeocodeAddress

Properties

- Geolocation
- HurricaneId

AppOptions

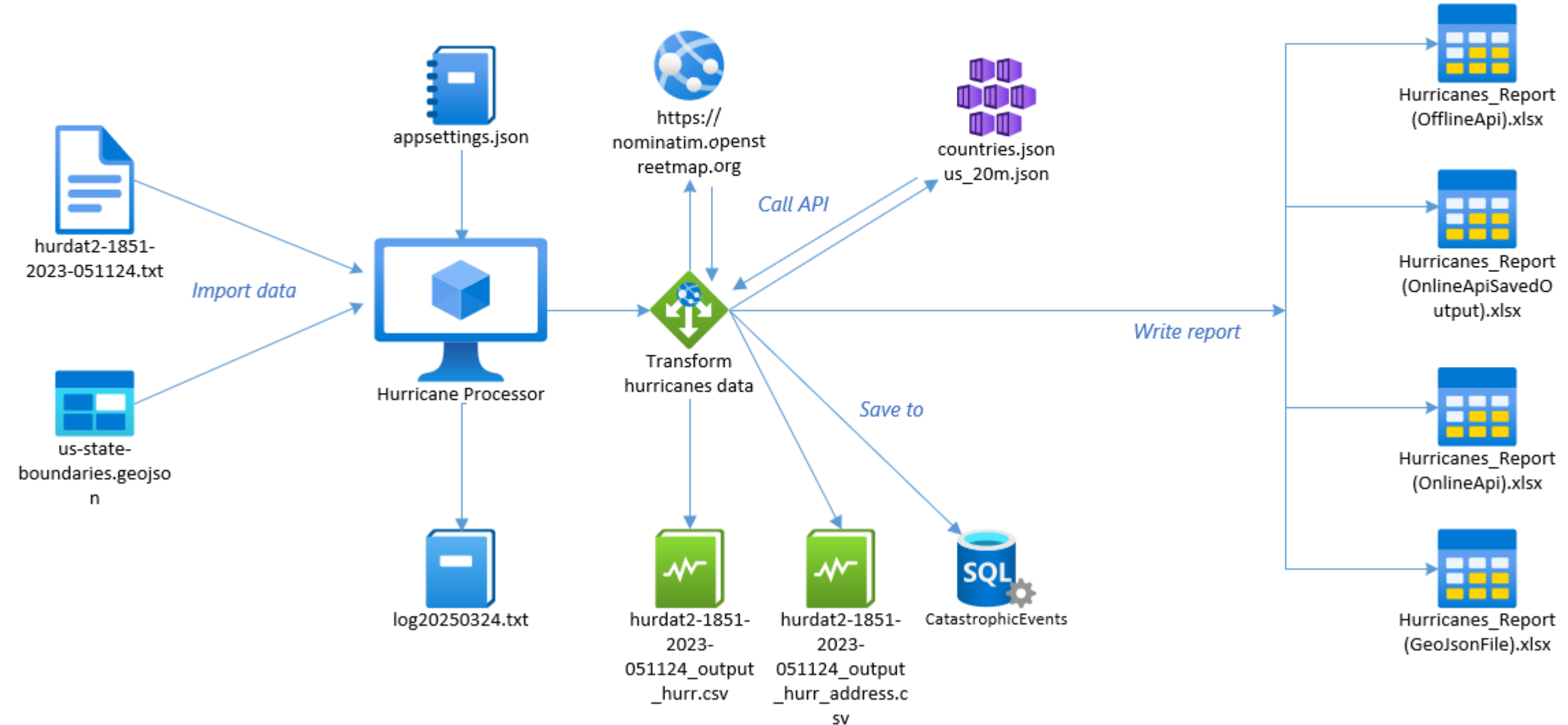
Class

Fields

- AppOptionsSection
- Properties
- DbConnection
- Display3DMap
- DisplayReport
- GeocodeApiUrl
- Hurricane3DMapFile
- Hurricane3DMapFileApp
- Hurricane3DMapIconFile
- HurricaneAddressDataSource
- HurricaneAddressOutputFile
- HurricaneDataSource
- HurricaneInputFile
- HurricaneOutputFile
- HurricaneReportDataSource
- HurricaneReportFilterStartYear
- HurricaneReportFilterStates
- SaveHurricanesToDb
- SRID
- UsaStateBoundariesFile

Nested Types

Application data sources and targets



Application database tables



Hurricane	
Id	
HeaderId	
Basin	
AtcfCycloneNumberForThatYear	
Name	
NumberOfBestTrackEntries	
Year	
Month	
Day	
HoursUTC	
MinutesUTC	
RecordIdentifier	
RecordIdentifierDesc	
StatusOfSystem	
StatusOfSystemDesc	
Latitude	
Longitude	
MaximumSustainedWindInKnots	
MinimumPressureInMillibars	
WindRadii34KtMaxNortheast	
WindRadii34KtMaxSoutheast	
WindRadii34KtMaxSouthwest	
WindRadii34KtMaxNorthwest	
WindRadii50KtMaxNortheast	
WindRadii50KtMaxSoutheast	
WindRadii50KtMaxSouthwest	
WindRadii50KtMaxNorthwest	
WindRadii64KtMaxNortheast	
WindRadii64KtMaxSoutheast	
WindRadii64KtMaxSouthwest	
WindRadii64KtMaxNorthwest	

HurricaneAddress	
HurricaneId	
Country	
CountryCode	
County	
HouseNumber	
PostCode	
State	
Town	
Village	
City	
Geolocation	
Id	

UsaStateBoundary	
State	
Coordinates	
Id	

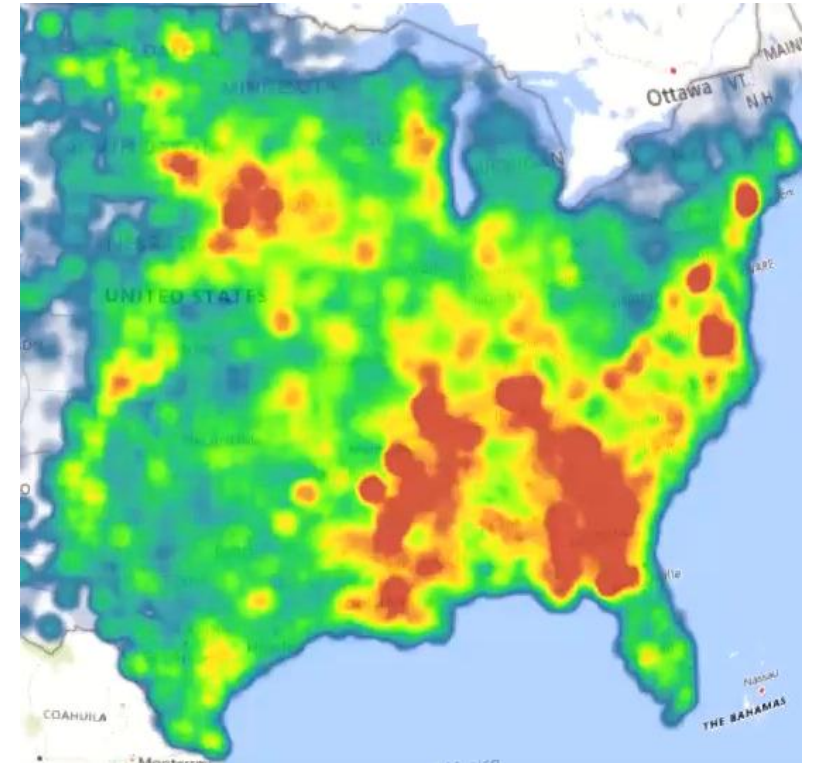
Relationship 'FK_HurricaneAddress_Hurricane_HurricaneId' between 'Hurricane' and 'HurricaneAddress'

EXCEL REPORT DETAILS

Displays the location of the hurricane event using latitude/longitude coordinates

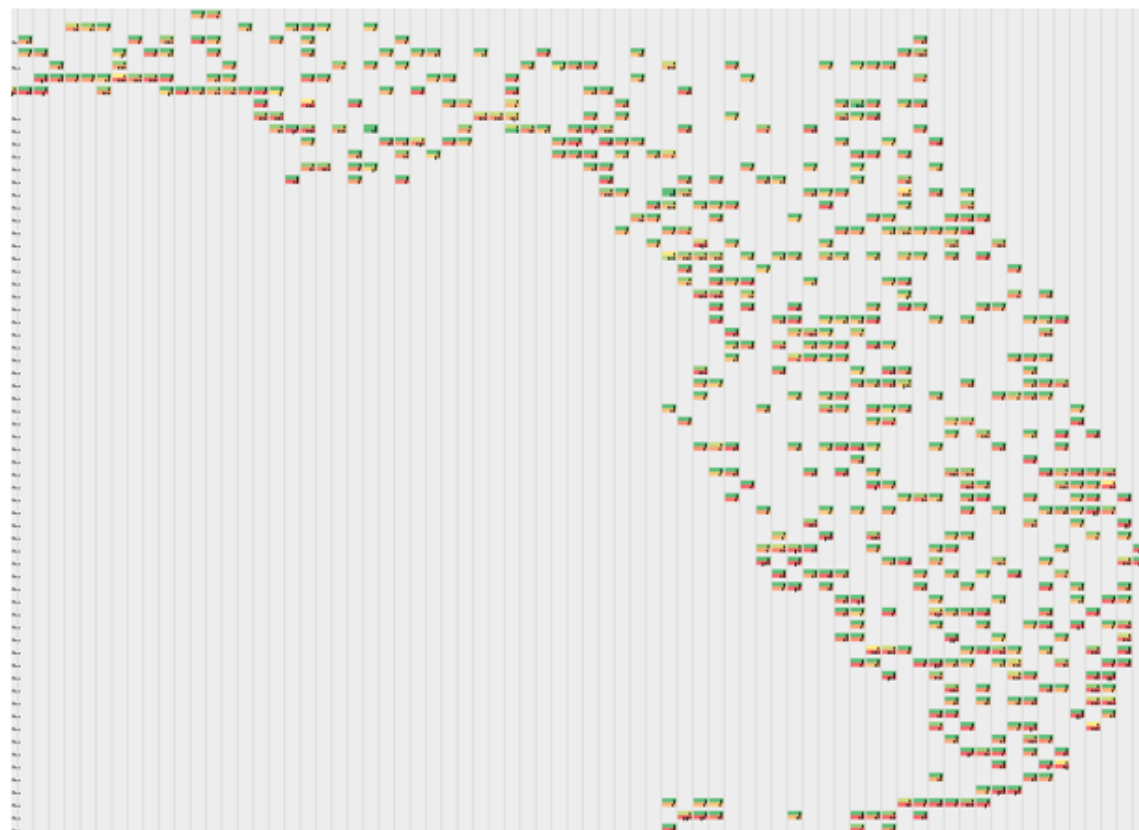
Includes number of times hurricane event occurred in that location and the average wind speed

Uses color coding based on average wind speed and number of times the event happened



HURRICANE EVENTS EXCEL REPORT

Name	State	Latitude	Longitude	Date	MaxWindSpeedInKnots
ANA	Florida	26	-80.9	06/30/1991 06:00 AM	20
ANA	Florida	26.2	-81.8	06/30/1991 12:00 PM	20
ANA	Florida	26.7	-82.4	06/30/1991 06:00 PM	20
ANA	Florida	27.3	-82.7	07/01/1991 12:00 AM	20
ANA	Florida	28	-82.7	07/01/1991 06:00 AM	20
ANA	Florida	28.7	-82.5	07/01/1991 12:00 PM	20
ANA	Florida	29.3	-82.2	07/01/1991 06:00 PM	20
ANA	Florida	29.9	-81.6	07/02/1991 12:00 AM	20
ANDREW	Florida	25.5	-80.2	08/24/1992 08:40 AM	145
ANDREW	Florida	25.5	-80.3	08/24/1992 09:05 AM	145
ANDREW	Florida	25.6	-81.2	08/24/1992 12:00 PM	115
ALBERTO	Florida	30.4	-86.5	07/03/1994 03:00 PM	55
ALBERTO	Florida	30.7	-86.3	07/03/1994 06:00 PM	45
BERYL	Florida	30	-85.6	08/16/1994 12:00 AM	50
BERYL	Florida	30.2	-85.4	08/16/1994 03:00 AM	50
BERYL	Florida	30.4	-85.3	08/16/1994 06:00 AM	50
GORDON	Florida	24.5	-81.6	11/15/1994 12:00 PM	45
GORDON	Florida	24.6	-81.7	11/15/1994 01:00 PM	45
GORDON	Florida	26.4	-82	11/16/1994 12:00 PM	45
GORDON	Florida	26.5	-81.9	11/16/1994 01:00 PM	45
GORDON	Florida	27.1	-81.4	11/16/1994 06:00 PM	45
GORDON	Florida	28.5	-80.6	11/21/1994 03:00 AM	25
GORDON	Florida	29.2	-81.5	11/21/1994 06:00 AM	20
ALLISON	Florida	29.6	-84.7	06/05/1995 12:00 PM	60



HURRICANE EVENTS EXCEL REPORT – HEAT MAP

1	1
75	115
2	1
82.5	30
3	3
86.6667	93.3333

Average of MaxWindSpeedInKnots

Value: 60

Row: 27.1 - Average of MaxWindSpeedInKnots

Column: -82.6

Count of Date

Value: 2

Row: 26.7 - Count of Date

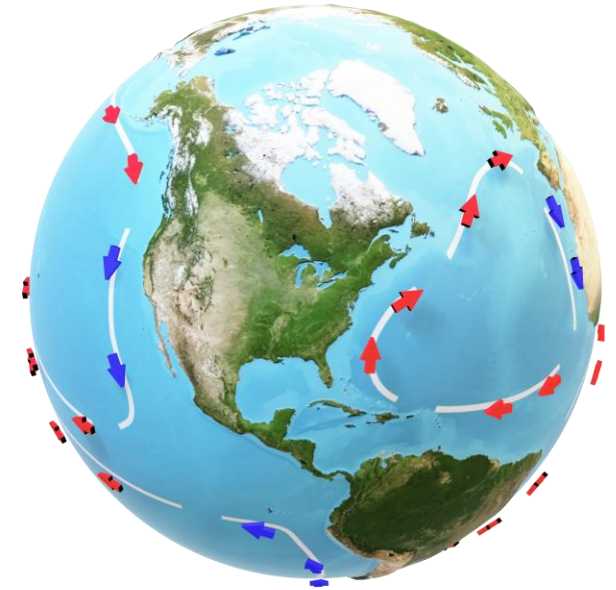
Column: -82.4

EXCEL REPORT DETAILS - 3D MAP

3D Map is
embedded into
Excel report: no
other files are
needed

Can be run by
clicking on the 3D
Map icon in Excel
data report tab

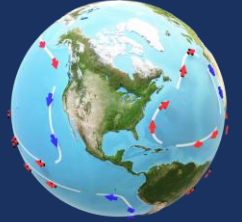
Displays the
chronological
history of hurricane
events in the certain
US State



HURRICANE EVENTS EXCEL REPORT – 3D MAP

Name	State	Latitude	Longitude	Date	MaxWindSpeedInKnots	MaxWindSpeedInKPH
ABBY	Florida	26.7	-82.3	06/04/1968 12:00 PM	55	101.86
ABBY	Florida	27.4	-81.8	06/04/1968 06:00 PM	45	83.34
ABBY	Florida	28	-81.1	06/05/1968 12:00 AM	45	83.34
ABBY	Florida	28.2	-80.8	06/05/1968 06:00 AM	45	83.34
ABBY	Florida	30.4	-81.4	06/06/1968 10:00 PM	55	101.86
ABBY	Florida	30.6	-81.5	06/07/1968 12:00 AM	50	92.6
AGNES	Florida	30.5	-85.2	06/20/1972 12:00 AM	45	83.34
ALBERTO	Florida	30.4	-86.5	07/03/1994 03:00 PM	55	101.86
ALBERTO	Florida	30.7	-86.3	07/03/1994 06:00 PM	45	83.34
ALBERTO	Florida	29.9	-83.7	06/13/2006 04:30 PM	40	74.08
ALBERTO	Florida	30.3	-83.5	06/13/2006 06:00 PM	35	64.82
ALBERTO	Florida	30.3	-86	05/28/2018 09:00 PM	40	74.08
ALBERTO	Florida	30.9	-86.1	05/29/2018 12:00 AM	30	55.56
ALEX	Florida	27.2	-80.4	06/04/2022 06:00 PM	40	74.08
ALICE	Florida	30.3	-85.9	06/06/1953 05:00 PM	40	74.08
ALICE	Florida	30.4	-85.9	06/06/1953 06:00 PM	40	74.08
ALICE	Florida	30.8	-85.8	06/07/1953 12:00 AM	25	46.3
ALLISON	Florida	29.9	-84.4	06/05/1995 02:00 PM	60	111.12
ALLISON	Florida	30.1	-84.2	06/05/1995 03:00 PM	55	101.86
ALMA	Florida	26.8	-80.1	08/26/1962 06:00 PM	30	55.56
ALMA	Florida	30.1	-84.2	06/09/1966 09:00 PM	75	138.9
ALMA	Florida	30.4	-84	06/10/1966 12:00 AM	60	111.12
ALMA	Florida	29.5	-82.9	05/25/1970 06:00 AM	30	55.56
ALPHA	Florida	30.5	-83	05/28/1972 06:00 AM	30	55.56

HURRICANE EVENTS EXCEL REPORT – 3D MAP



8/30/2023 12:00 PM





THANK YOU

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