



Team Ceres

User Manual

ZTF Asteroid Analysis Tool

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Table of Contents

Introduction	3
Installation	3
Configuration and Daily Operation	12
Maintenance	18
Troubleshooting	20
Conclusion	23

1. Introduction

This is the user manual for the ZTF Asteroid Analysis Tool, or ZAAT for short. The ZAAT is an online web application made for browsing asteroid data provided from the Zwicky Transient Facility in California, and provides users with an easy to use interface that displays various asteroid metrics and makes visualizing the data easy. The purpose of these instructions is to ensure that end users of the product have the resources they need to navigate the ZAAT interface with ease. This user manual will contain various bits of information for managing the ZAAT and will teach users how to manage the interface for any maintenance and troubleshooting needed. We hope that these instructions will provide all of the information you need to use and manage our product.

2. Installation

Required on windows server:

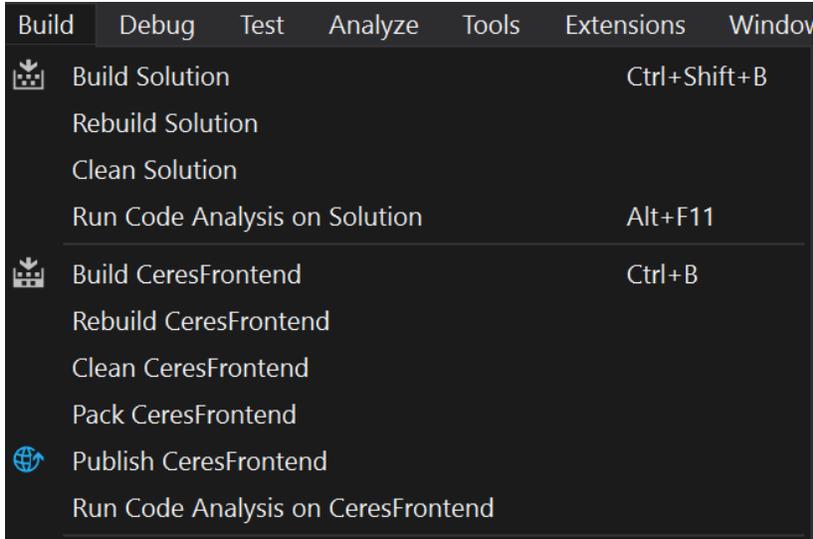
- .NET Core 3.1 Hosting Bundle
- Node.js
- MySQL Server
- IIS 7 / 8

If compiling from source code, Visual Studio 2019 is also required.

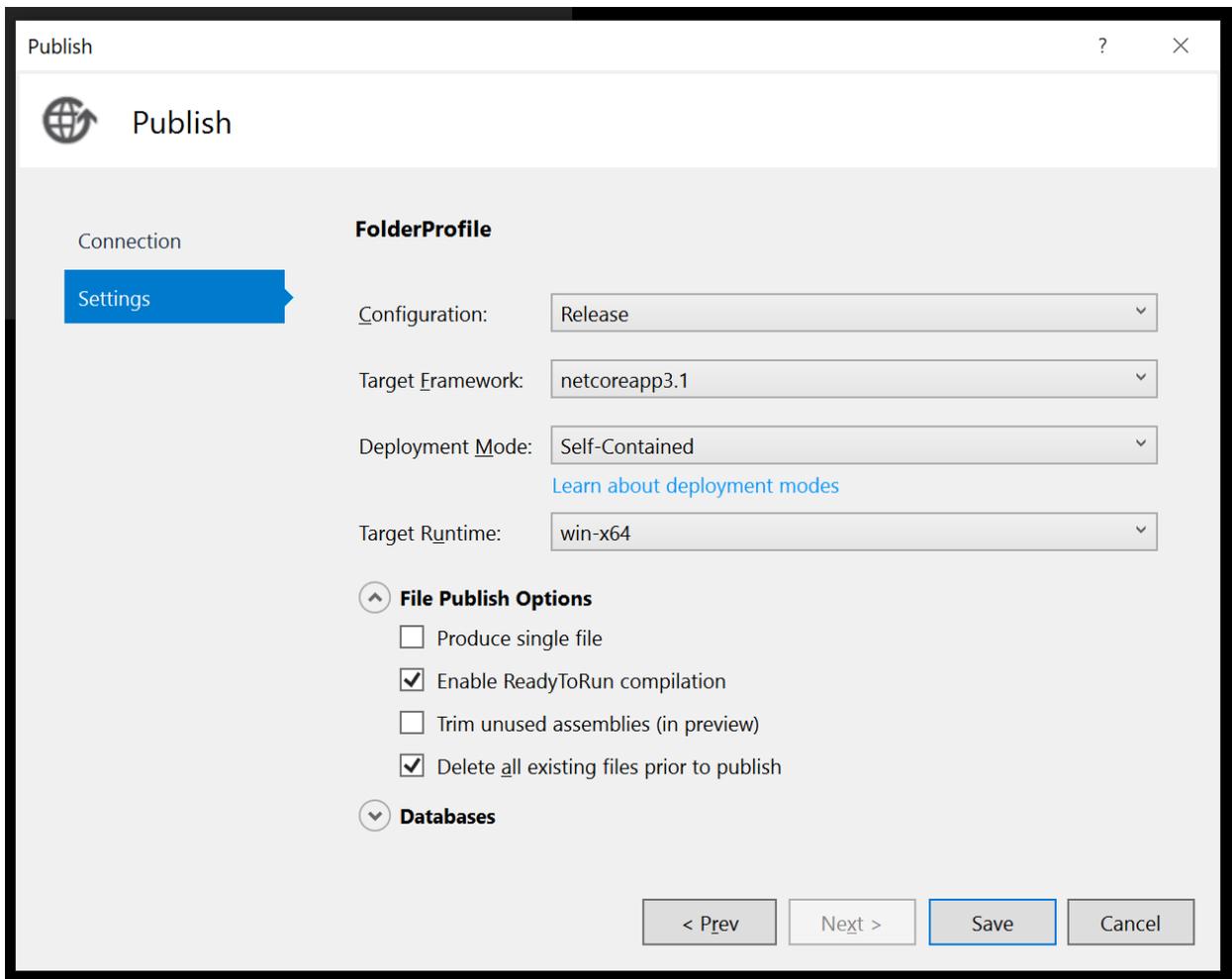
Building From Source

Visual Studio 2019 is required to build all 3 parts of the source code (import, api, and frontend). For all 3 projects, the initial build configuration is very similar.

Opening the Build menu from Visual Studio, click "Publish [project name]"



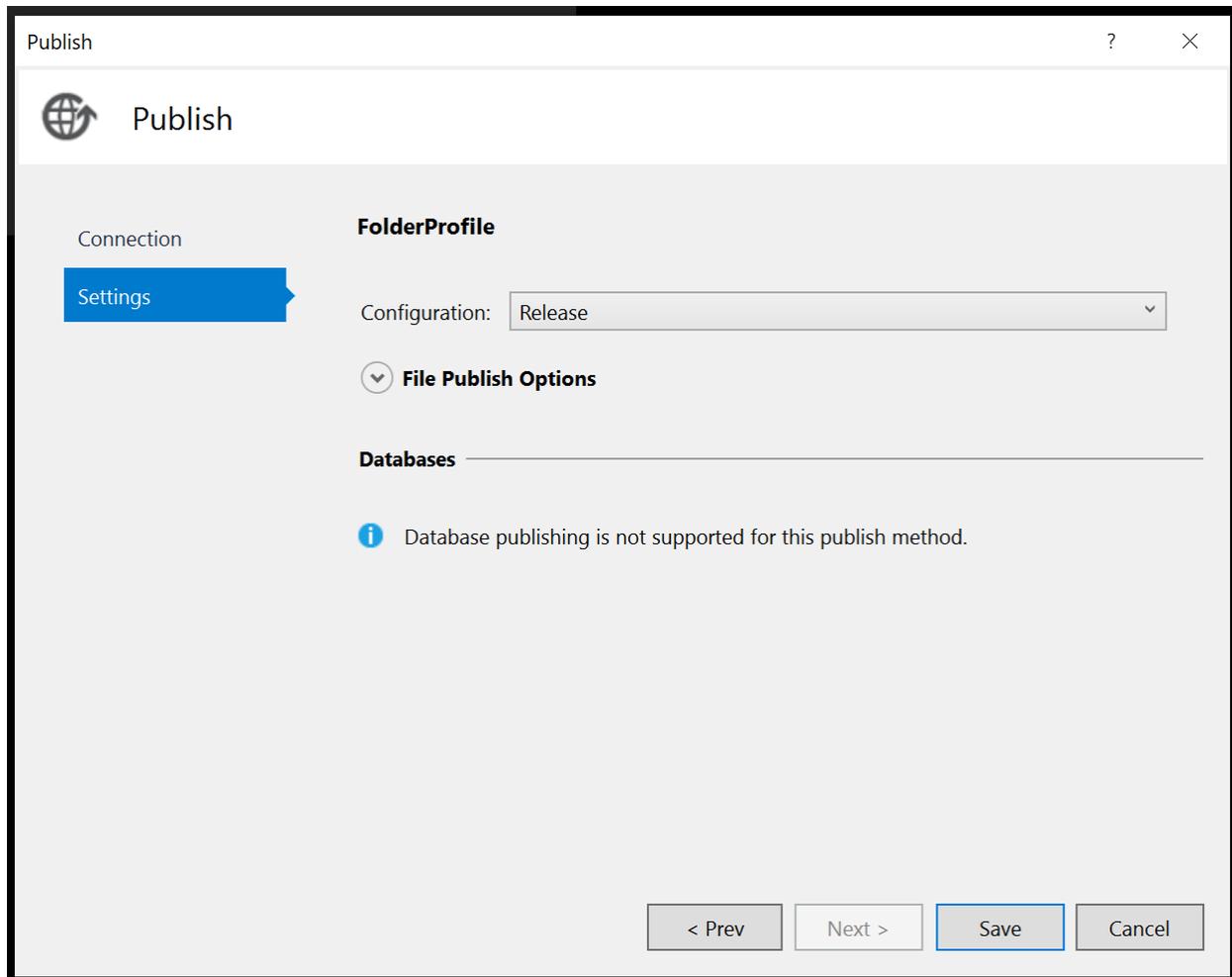
For the frontend, the build is configured as follows:



For the database import tool, the build configuration is set up in the .sln file by default and should publish the .exe and any required DLLs to

“<project location on disk>\bin\Release\netcoreapp3.1\publish\”

For the API, the build configuration looks as follows:



Setting up the Database

Once MySQL has been installed and an administrative user configured, the following tables must be created manually: `users` and `bookmarks`. The .sql file to create these

tables is located on the Desktop on the hosted server instance provided, but also along with the database import job repository just in case.

Running the Import Tool

Once the MySQL database has been created and configured according to the above step, the 3 main tables can be imported: `ztf`, `timeseries`, and `asteroids`. These tables can be selectively imported by way of command line arguments supplied to the import utility executable, which are “-ztf”, “-timeseries”, and “-ast”, respectively.

Note that the import tool’s schema configuration file must be changed if the schema of any of the corresponding .db or .csv files change. This file should be located in the specified directory within DBImport.dll.config (screenshot below).

```
1 <?xml version="1.0" encoding="utf-8" ?>
2 <configuration>
3   <appSettings>
4     <add key="ast_info_db_url" value="https://rcdata.nau.edu/trilling/asteroid_data/database/ast_information.db" />
5     <add key="timeseries_csv_url" value="https://rcdata.nau.edu/trilling/asteroid_data/database/timeseries.csv" />
6     <add key="pub_good_db_url" value="https://rcdata.nau.edu/trilling/asteroid_data/database/ztf.db" />
7     <add key="working_dir" value="C:\\ceres_db_integration\\" />
8     <add key="schema_file" value="C:\\ceres_db_integration\\schema.json" />
9     <add key="db_user" value="admin" />
10    <add key="db_password" value="password" />
11  </appSettings>
12 </configuration>
```

In addition, the URLs for each of the source .db and .csv files needs to be specified, as well as the MySQL username and password.

Hosting the API / Frontend

Once the API and/or Frontend project(s) have been built from source according to the instructions above, the process for hosting them is identical. First, create a directory somewhere accessible by the IIS worker process for each of the websites.

In this example, C:\websites\api and C:\websites\frontend were chosen (see below).

This PC > Local Disk (C:) > websites				
	Name	Date modified	Type	Size
ss	api	4/27/2021 6:54 AM	File folder	
its	frontend	4/28/2021 8:18 AM	File folder	

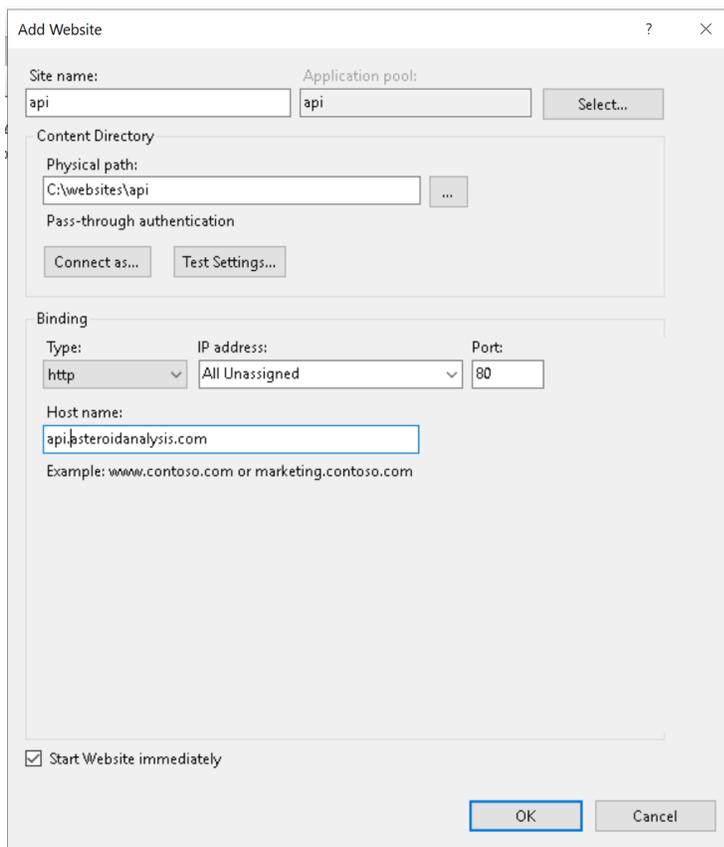
Next, copy the respective binaries that were compiled by Visual Studio to these directories.

This PC > Local Disk (C:) > websites > api				
	Name	Date modified	Type	Size
ss	bin	4/27/2021 6:54 AM	File folder	
nts	Content	4/27/2021 6:54 AM	File folder	
ds	Scripts	4/27/2021 6:53 AM	File folder	
	Views	4/27/2021 6:53 AM	File folder	
	favicon.ico	3/31/2021 8:58 PM	Icon	32 KB
	Global.asax	3/31/2021 8:58 PM	ASAX File	1 KB
_integration	Web.config	4/18/2021 7:23 AM	CONFIG File	6 KB

This PC > Local Disk (C:) > websites > frontend				
	Name	Date modified	Type	Size
ss	ClientApp	4/28/2021 8:18 AM	File folder	
nts	api-ms-win-core-console-l1-1-0.dll	4/20/2018 7:28 AM	Application extens...	19 KB
ds	api-ms-win-core-datetime-l1-1-0.dll	4/20/2018 7:28 AM	Application extens...	19 KB
	api-ms-win-core-debug-l1-1-0.dll	4/20/2018 7:28 AM	Application extens...	19 KB
	api-ms-win-core-errorhandling-l1-1-0.dll	4/20/2018 7:28 AM	Application extens...	19 KB
	api-ms-win-core-file-l1-1-0.dll	4/20/2018 7:29 AM	Application extens...	22 KB
	api-ms-win-core-file-l1-2-0.dll	4/20/2018 7:37 AM	Application extens...	19 KB
	api-ms-win-core-file-l2-1-0.dll	4/20/2018 7:37 AM	Application extens...	19 KB
	api-ms-win-core-handle-l1-1-0.dll	4/20/2018 7:37 AM	Application extens...	19 KB
_integration	api-ms-win-core-heap-l1-1-0.dll	4/20/2018 7:37 AM	Application extens...	19 KB

Make sure to configure the Web.config file for the API to use the appropriate MySQL username/password.

The next step is creating two website instances in IIS. Right click the "Sites" folder, then "Add website".



Specifying a user account to connect as is critical for the website to function properly.

Issuing an SSL Certificate

For this project, we used the CA at letsencrypt.org

For this (optional) step, the following are required:

- openssl binaries (<https://www.openssl.org/>)
- certbot binaries (<https://certbot.eff.org/>)

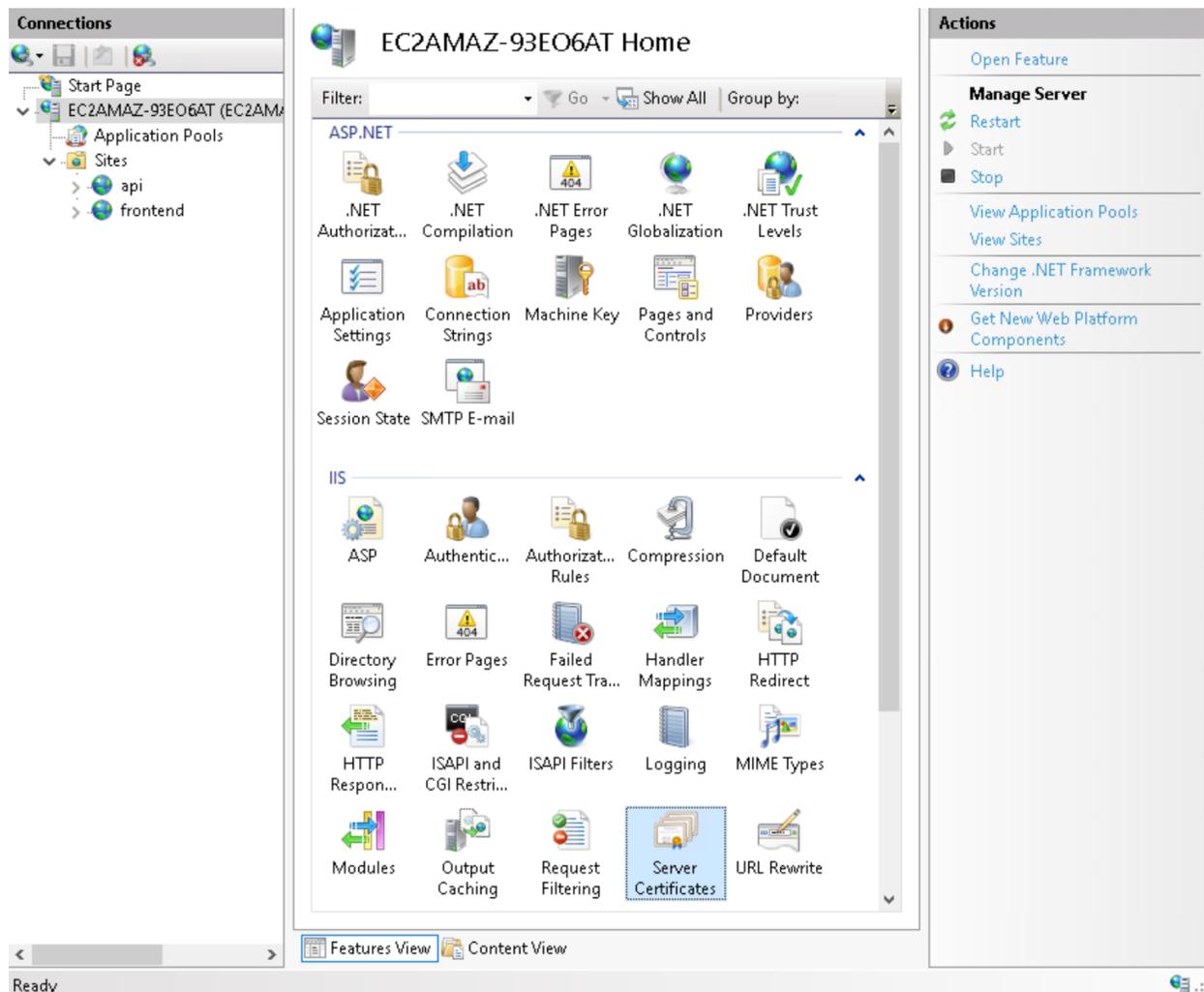
First, stop the two websites set up in the previous step.

Run certbot from the command line, “certbot certonly”.

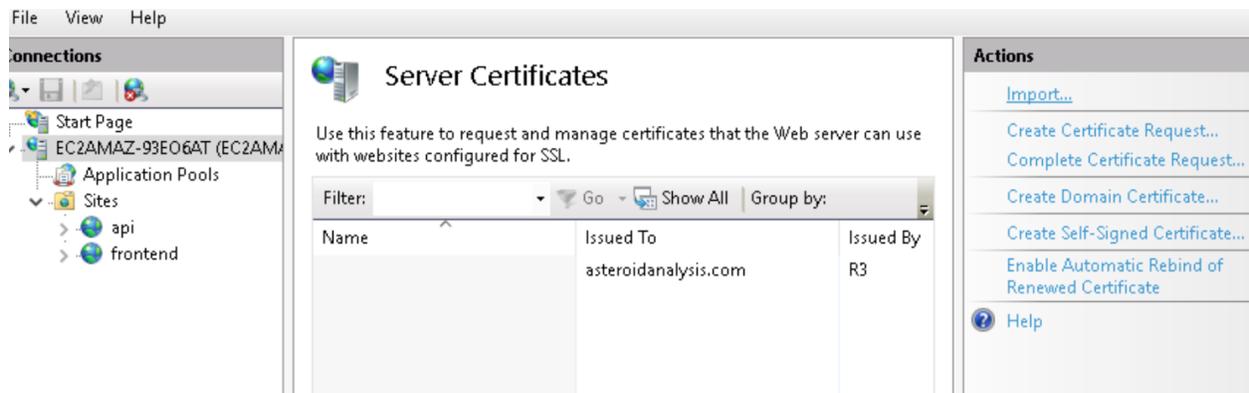
Follow the instructions prompted, entering the name of the domain(s) you want an SSL certificate for.

Then, run openssl and convert the certr1.pem and privkey1.pem into a .pfx file to be imported into IIS.

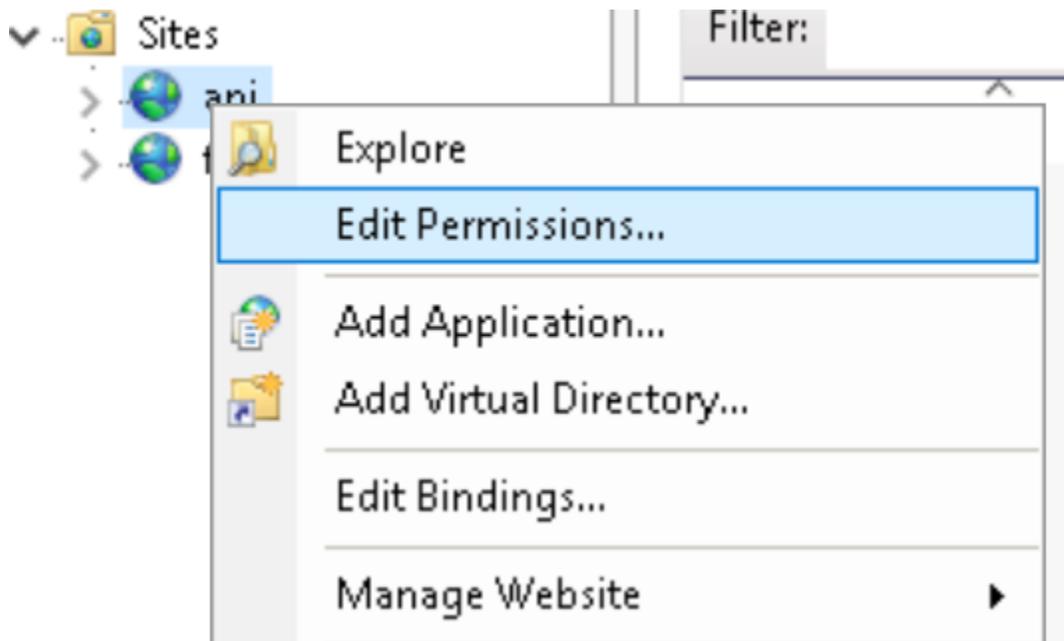
Once the .pfx file has been created, open IIS and click the machine name, then “Server Certificates”.



Next, “Import...”



Specify the .pfx and password used in the command line for openssl, then click “ok”.
Once imported, click each website and then “Edit Bindings...”



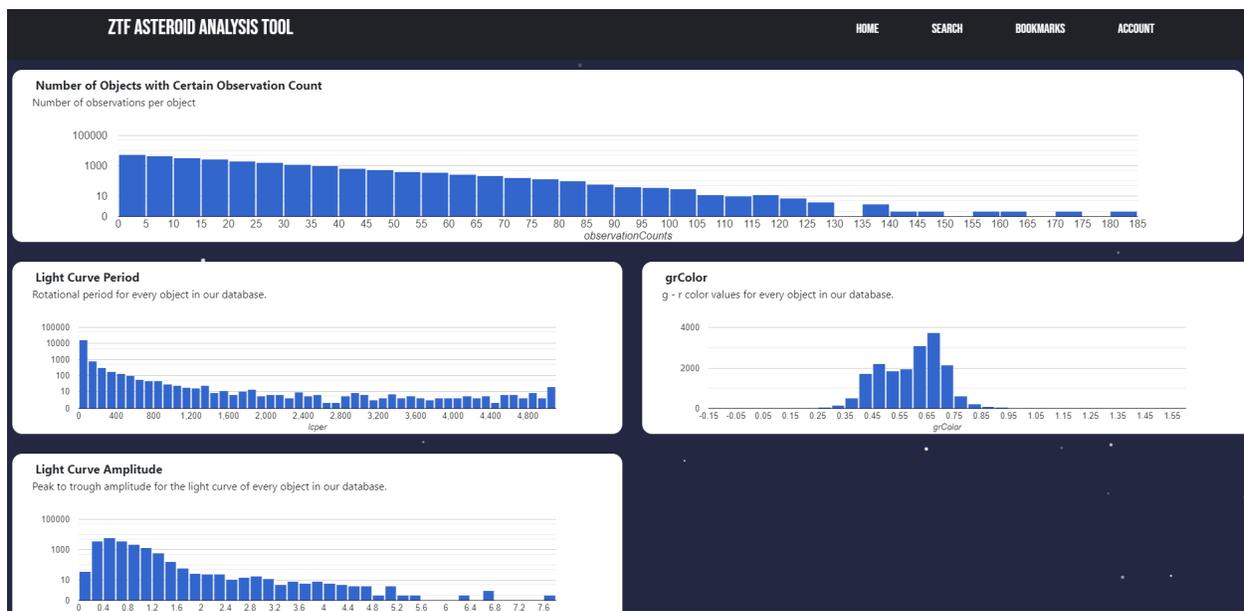
Then select “https”, enter the hostname, and select the imported certificate.

3. Configuration and Daily Operation

This section of the user manual will discuss simple day to day operations of the ZAAT and how new users can navigate the interface with very little setup. The main focus of this area is to help users find the interface online, create an account, and show them the tools they have access to with their newly created account.

How To Access the ZAAT Interface

In order to access the ZAAT Interface you will need a computer with access to the internet and a web browser of your choice. In the web browser's address bar enter the following URL: "asteroidanalysis.com" and press "Enter".

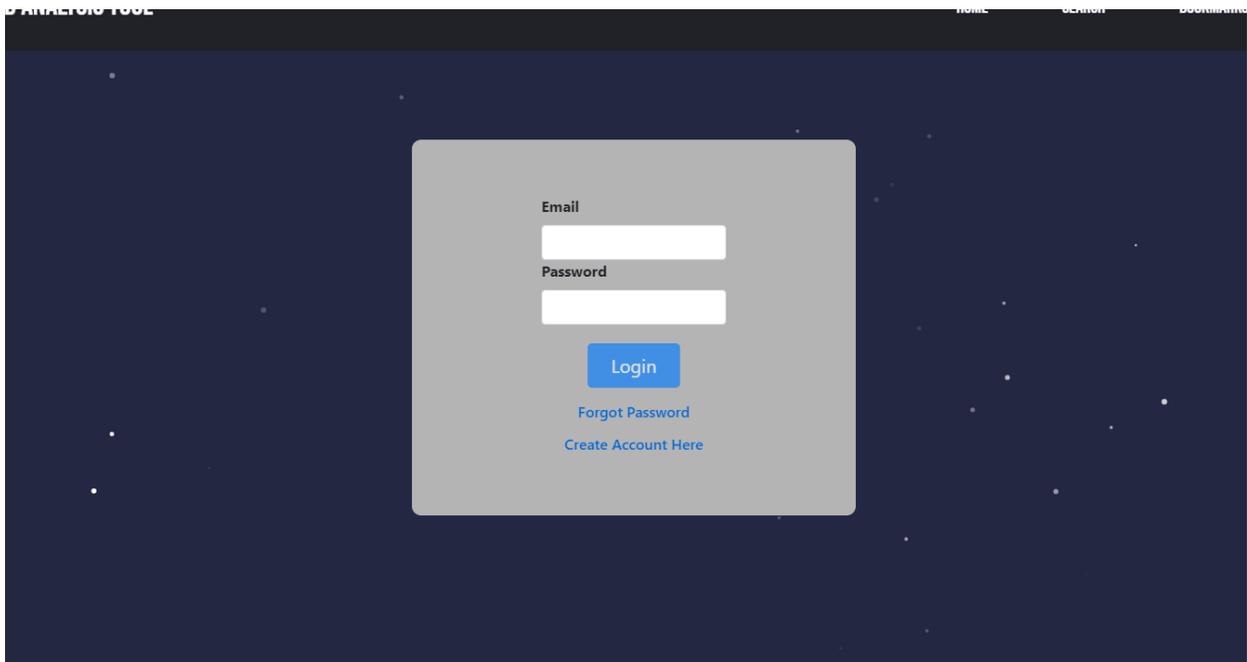


Once you have navigated to the URL, you will be introduced to the ZAAT's homepage. This page displays various metrics from the Zwicky Transient Facility's database and is the first page you will see every time you access the interface.

Note the size of the graphs and the amount of data displayed on each histogram. While the amount of data shown can be overwhelming, the graphs are user friendly and display the value of each histogram bar when you hover your mouse over the data points.

Creating an Account

In order to utilize much of the functionality from the ZAAT interface, new users are going to want to create an account. In order to begin doing so, navigate to the “Account” link at the top right of the page and click to move to the login screen.



Once you have done so, you will be brought to the base account page. If you already have an account, you can simply sign in by entering your account credentials. If you are a new user, you will want to click the “Create Account Here” link below the “Login” button.

After you navigate to the account creation page, you will be presented with a form to fill out that contains space for your name, email address, and password. The form uses very little personal information and should not take very long to fill out. When you have finished filling out the form with your information, you may now press the “Create” button at the bottom of the page to have your account created! Once you have done so, you are now ready to browse the ZAAT’s asteroid data.

Browsing Asteroid Data

Now that you have created your account on the ZAAT Interface, you may begin searching for asteroid information. To begin doing so, click on the “Search” link towards the top right of the page. After doing this, you will be brought to a page with a very fancy moving star background and a search filter on the left of the page. To search for asteroids you can directly use the search filter to find an asteroid’s specific number or you can click the drop down arrow attached to the “Search By Name” bar and click on “Search by Property”. Doing so will give you access to the “Asteroid” drop down menu below and will provide you with the asteroid properties you may search by and a minimum and maximum value to better filter your search.

When you select a property the minimum and maximum values found for any asteroid are automatically displayed so users do not have to guess the range of the data they are searching in. In order to populate results to the search page, click the “Filter” button and you will see asteroids within the minimum and maximum range displayed on the display to the right.



Once the search results have been generated, more tools will become available for users to interact with. The main three being the individual asteroid page, the share button, and the bookmark button. By clicking the “Share” button, you will generate a link to an asteroid’s individual information and can share that link with others to do the

same. Using the star icon to the right of the search results will save the individual asteroid and add it to your list of bookmarks in case you want to view it in the future. We will discuss this feature more as we continue through the ZAAT Interface's various pages.

Viewing an Individual Asteroid

Each individual asteroid has its own webpage and information about that specific asteroid. In order to access the asteroid's individual data, you will need to click on the hyperlink next to the "ssnamer" which is also the asteroid's individual ID. Doing so will take you to a page that looks very similar to the image below.



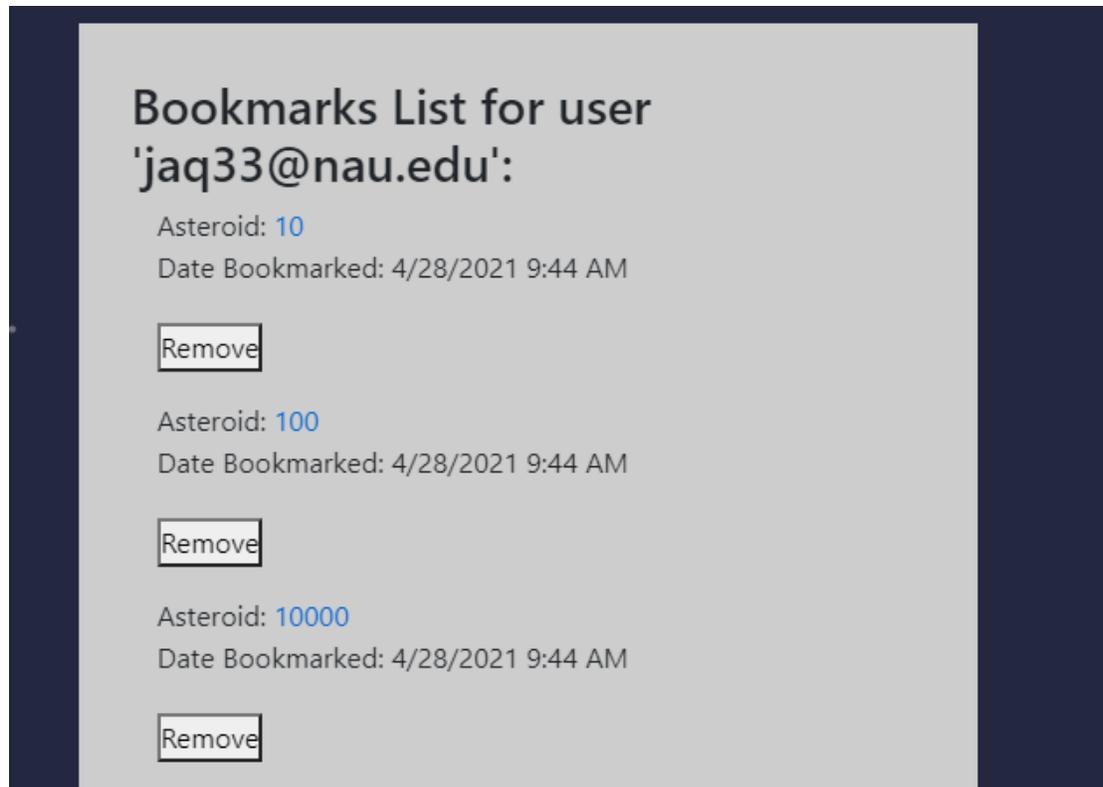
On the right side of the web page, you can see all of the asteroid metrics that the Zwicky Transient Facility has for each individual asteroid. Many categories may appear blank, but this may be due to the lack of observations found from the original database.

Similarly to the homepage of the ZAAT Interface, this page will display a graph showing various metrics of each asteroid and it can even be customized to change the data displayed on each axis. Also similar to the homepage, the data points can be hovered over with your mouse to display the precise value from each axis.

If you are interested in saving these graphs for future reference, you can click on the “Download PNG” button, and it will save a .png version of the graph currently being displayed. Along with this, we have also included links to the Antares and MARS interfaces, which also use data from the Zwicky Transient Facility to help display this data.

Viewing My Bookmarks

In order to view any asteroids that you have bookmarked on your account, click on the “Bookmarks” link at the top of the interface page. If you are signed in to an account on the interface, any asteroids that you bookmarked on the search page will appear here in an ordered list. The bookmark page will display a link to each individual asteroid and will also show the time and date it was bookmarked. In order to remove an asteroid from the bookmark list, you will need to click the “Remove” button below each asteroid entry that you would like to remove.



Managing my Account

Finally, the last major portion of the ZAAT Interface is the “Account” page also found at the top of the screen. When you navigate to the account page, you will be presented with several different actions to manage your account.

The first set of options pertains specifically to your account name and password. You will have the option to change the name of your account or reset your password from this page to something else. Along with this, you are presented with the option to sign out of the interface if this is something you would like to do.

Below this you will also find a section to adjust the number of search results that appear per page. By default, the search results are set to display 25 asteroids but it can be adjusted to any number. Decreasing the number of results will yield shorter response time but the number of results your request is technically limited to the number of asteroid observations available.

Lastly, there are two options to help clear your account information by removing all of your bookmarks or to delete your account. These options are accessible using the two labelled buttons at the bottom of the account page. These options are non-reversible so be wary when completing either action, as it will not be able to be undone.

The image shows a user account settings page with three main sections:

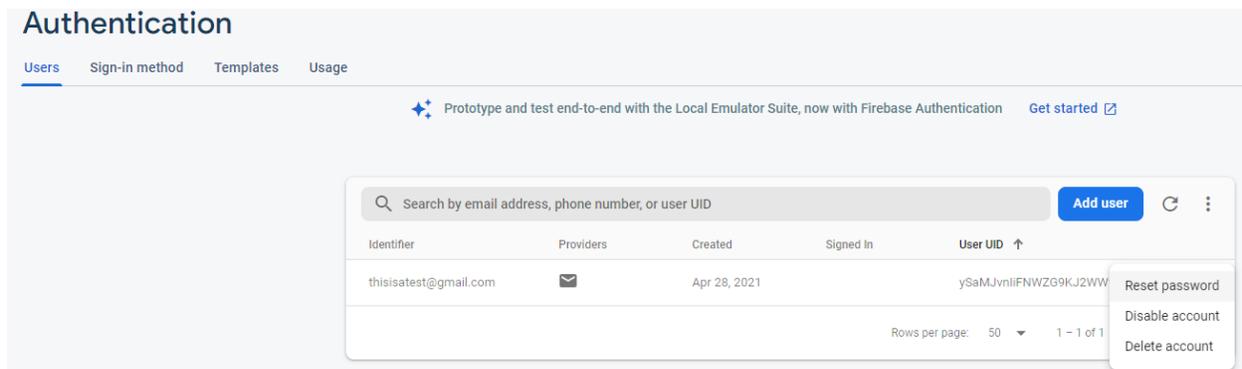
- Basic Info:** Contains fields for First Name (Javier), Last Name (Quintana), and Email (jaq33@nau.edu). There is a "Reset Password" button next to the Password field and a "Sign Out" button at the bottom.
- Search Settings:** Contains a "Results per Page" field set to 10.
- Other:** Contains two buttons: "Clear" next to "Clear Bookmarked Asteroids" and "Delete" next to "Delete Account".

4. Maintenance

This portion of the user manual was created to help new administrators of the interface maintain and keep up with the inner workings of the ZAAT. Some of the information discussed here will pertain to managing user accounts, checking server import statuses, and other useful server information.

Managing User Accounts

As an administrator, if an account needs to be manually modified and/or removed from the system, this will all be done through Firebase. All user authentication is handled under the Authentication tab on Firebase.



If an admin would like to create an account manually, they can navigate to the authentication tab and click “add user” where they will then add the corresponding information that they are prompted for.

In addition to adding an account, accounts can be deleted, disabled, and the password for the corresponding account can be reset by clicking the three vertical dots next to the user’s name under the user tab.

As an admin, the ways of signing into a user’s account can be controlled as well. After navigating to the “Sign-In Method” tab, a list of possible ways of signing in will be displayed.

Finally, within the firebase UI, an admin has the capability to manage both the templates that Users receive for account creation and password reset as well as how many users are utilizing Firebase authentication on the web application.

Managing The Server

Managing the AWS server is straightforward and extremely similar to that of a regular desktop computer.

The easiest way to restart the web server is to navigate to the start menu, hit the power button, and then finally hit restart. This will restart the machine similar to how user's restart their computers. In order to restart the MySQL Database, this can be done via the command line. Finally, in order to restart IIS, this can be achieved through the server manager interface.

Upon restarting these utilities, the node application (front-end) does not need any commands to get the web server up and running again.

Finally, if an admin is running a server import job to update the database, this server import job can be managed via the batch file associated with it. Due to the size of the data being imported, database import jobs can take a lengthy time so plan accordingly.

5. Troubleshooting

The troubleshooting portion of this manual will provide you with information regarding common and uncommon problems that were encountered during the use of the interface. As you will soon see, most issues users encounter are fairly simple to fix and only require access to the interface.

Issues with Signing In

If you encounter problems with signing in, the tool has some built in methods to help with this. Firstly, to ensure you have an account created, you can either attempt to send a password reset email or attempt to create a new account. The password reset email will appear within your inbox in under 10 minutes and allows you to quickly reset your password to login. If this approach doesn't work, then you likely do not have an account

setup and you can follow the link from the login page to get to the account creation page.

Pages Moving Slowly on the ZAAT

If pages are moving slowly within the application, first try clearing your cookies and cache first to remove any unwanted bookmark data. This usually happens when you've been using the tool frequently. After this, you can attempt to lower your query settings within the profile settings. This won't limit the data you get to see, it will just spread it out more to avoid overloading our database. Finally, the user can try to clear all bookmarks within the profile page to further reduce the load on the server.

Unable to Bookmark Items

First thing here is to make sure that you are signed in. In some cases, when accounts were being created, they managed to get redirected as though the account was created successfully, however the authentication service never returned accurate data. In this case see other steps to get signed in. Once signed in, the bookmarks and bookmarks page should be working optimally.

Sign In Information not Remembered

The first approach found in the issues with signing in section outlines most of the steps needed to access an account where the information is unknown. From here, the next steps to take would be to have administrator users login to the Firebase Authentication Console. This page will provide the administrator with the information needed to verify that an account exists and under which email account it is registered. The administrator can even manually force a password reset email to be sent. If troubleshooting still persists with the user accounts, the administrator can wipe out an account in the console so that a new account can be created.

Too Many Results Appear During Search

Once logged in, users have the option to control how many results appear per page in each search they perform. If the user desires to change this, they may navigate to their profile page and edit the field showing within their populated preferences. To update this field simply click off of the text entry box, and the preference will update automatically.

Change My Name

Similarly to the results updating, users also have the ability to update their desired display name within the application. Simply navigate to the profile page, and once logged in the user can see their currently saved display name. Simply click into the field for name, update the field, and click away to update the setting.

Remove All Current Bookmarks

Another feature of the application is bookmarking items. However, if the user wishes to remove bookmarked items they may do so manually within the bookmark page itself, or they can remove all of their bookmarks on the account page. Simply navigate to the account page, and once logged in click on the button that says remove all bookmarks. Be careful though, this will erase the bookmarks you have saved and will have to recover any desired bookmarks that are lost.

Delete My Account

Finally if a user needs to manually delete their account for any reason, this can be done within the profile page. Once signed in, a user has the ability to delete an account from the authentication api and our database. After this, all user data will be lost and the user can restart fresh with a new account.

6. Conclusion

We hope you have found the user manual helpful in your search for answers and asteroids! The team that developed this interface has enjoyed working on this product and we are excited to help catalog the data from our solar system in a way that makes learning easier. Team Ceres thanks Professor Trilling and Professor Gowanlock for all of their support in the development of this product and we are excited to see how it will develop with future generations of capstone developers.

