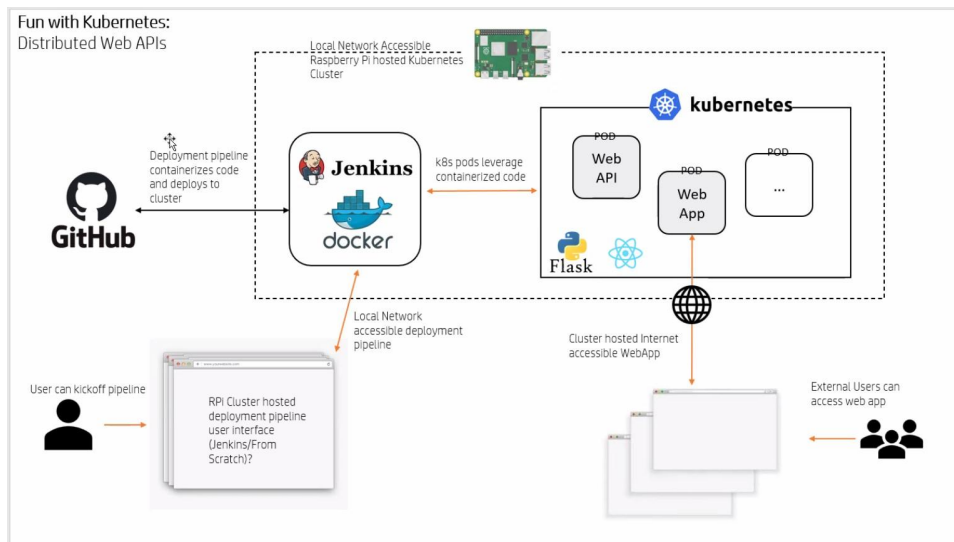
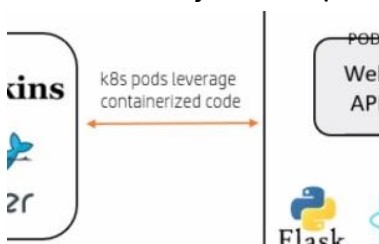


Section 1: Process Flows:

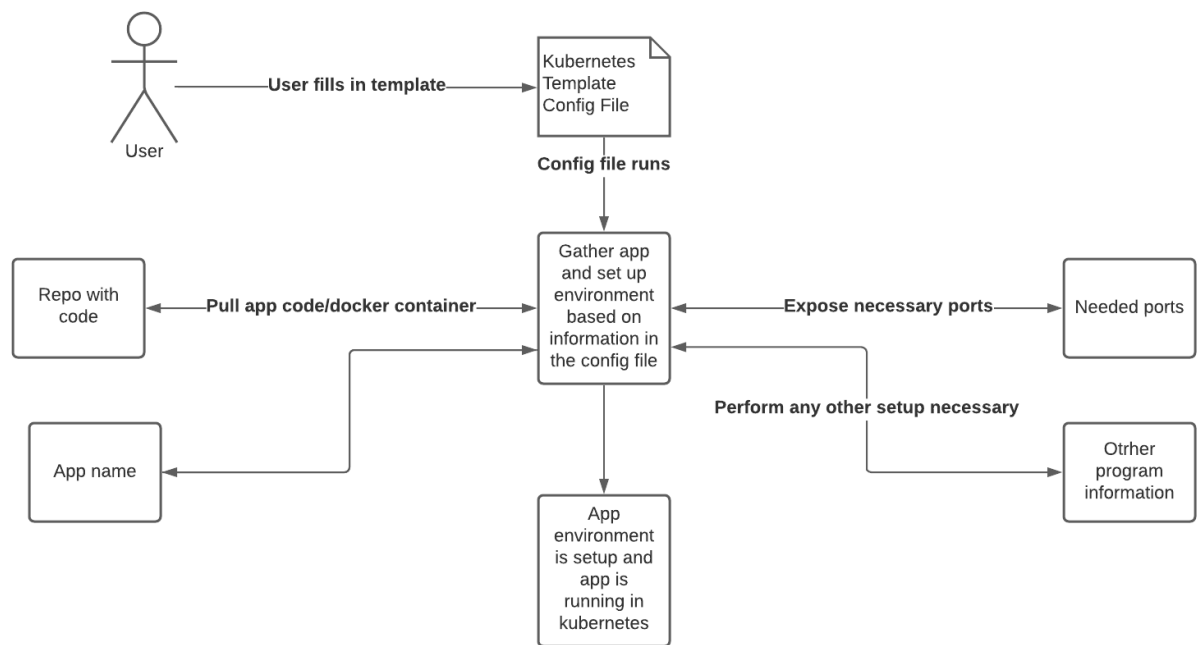
A. Major Project Components as provide by our project partner:



B. Individual Project Component:



I will be focused on this segment of the project:



The portion of this project that I am responsible for is the setup of the Kubernetes CI/CD configuration file which will be used to set up the Kubernetes environment for a user's application. This is phase 2 of 5 which we have defined as a group with our project partner. This will be done as follows. The user will be provided a template file which they will open and fill out with the information necessary to launch their application in Kubernetes. That completed configuration file will be used to set up the Kubernetes environment for the application. This will be done by completing setup tasks such as pulling any code or docker containers from any repos specified in the configuration file, exposing any ports provided in the file, naming the application appropriately, and completing any other necessary processes specified in the file. I will be responsible for designing the configuration file template which will be given to the user when they wish to launch the application, and then executing the instructions in the filled out configuration file.

Section 2: User Stories:

User story 1:

"As a user of this service, I need a template file that is clearly laid out, so that I can easily and accurately provide the information about my application that is needed to configure Kubernetes."

User Story 2:

"As the project partner, I need my team to create an easy to use configuration file, so that users of this project can successfully launch their application in a way that is as simple and user friendly as possible, and so that they do not face any frustrations with setup or other negative experiences using this service."

User Story 3:

"As a developer on this project, I need to develop an easy to use configuration file template that works correctly with the information filled in by the user, so that our service can successfully set up and launch the user's application without any errors or other problems."

User Story 4:

"As a user of the product produced by the client, I need to be able to use the system as it was intended to be used so that I know that the Kubernetes configuration was successful, which will provide me with a safer and more pleasant experience."

User Story 5:

“As a user of this service, I need the template configuration file to work properly with the information I provide it so that my application works correctly without any problems or bugs from the Kubernetes configuration process, some of which may not be as obvious as others, which could lead to problems for my users latter on.”

Section 3: Personal Iteration Plan and Estimation:

I believe that work on this portion of the project will begin most likely at the start of Winter term, or possibly as early as the end of Fall term. This is because my portion of the project is in an early phase of the development. The only part of the project that is blocking my progress on this is phase 1, which entails installing Kubernetes and setting it up. This, however, should be a short and simple phase which will not block my phase, phase 2, for very long. The only other requirement that needs to be completed before beginning work on this phase is the general research our entire team will be doing in order to fully understand what we need to do to accomplish our phases and what the file product should look like. This research so far includes how to use the tools we will be working with which include Docker, Kubernetes, Flask, React, etc. Once we are all familiar with these tools, we can begin working on the phases of our project. I believe that we can complete this research by the end of the term. I also believe that it is possible for phase 1 to be completed by the end of the term or in early Winter term, which would allow work on phase 2 to begin.

In addition, since each phase is quite inclusive of elements of the other phases, we will each help each other on each phase. We have decided to work in a system where one person is the leader and main contributor of a phase. When someone is done with or can not work on their phase, they can help the others to complete their phases. This way we will all contribute and fully understand each phase of the development of this project.

Section 4: Solution Architecture:

For this project, we have chosen to use Kubernetes to deploy user applications because it is a free and easy to use option. According to the Kubernetes documentation [1], it allows a user to continuously serve and update their containerized software so that their users are able to connect to their service constantly. The article by Red Hat [2] identifies Kubernetes as a solution that “automates many of the manual processes

involved in deploying, managing, and scaling containerized applications.” We hope to use this functionality to allow users to deploy an application on a Raspberry Pi which will be accessible to the public for a much lower cost than hosting their applications on other services. According to Red Hat [2] Kubernetes works by creating a cluster of machines running some form of Linux which are used to deploy applications which are made up of containers (such as Docker containers). In addition, Kubernetes allows a developer to schedule updates to go out to these pods in order to keep the running applications up to date and usable. With that in mind, I will be responsible for setting up the configuration template which users will complete to start up their Kubernetes environment. According to the Kubernetes documentation on configuration [3], the configuration format recommended for Kubernetes is YAML. This section of the Kubernetes documentation [3] also recommends the use of labels and kubectl. In this context, labels, “identify semantic attributes of your application or Deployment...” and kubectl is a command which searches a directory for any configuration files which are used in Kubernetes configuration. Because we plan to use the YAML format for the configuration file, I will likely develop a template, using labels, which will guide our user to filling out all of their configuration information.

There are a few ways I think the template could be laid out. The first is that the user will be provided with one template file of which we have created. The labels in this file will allow the user to easily fill in the correct information. However, because some users may have more information that needs to be included than others, this template will need to be very large and all inclusive to possible pieces of configuration information the user may want to specify. The other possible method I have come up with is creating multiple templates, each of which holds different information. In this case, there will be a general template file which will hold crucial information that most if not all users will need to set up Kubernetes, while the other templates will hold configuration information that is less crucial. These less crucial templates will each contain information in a certain category so that the users can easily select the appropriate set of templates in order to provide Kubernetes with all of the necessary configuration information. If this template option is chosen, then kubectl will be used to gather the completed templates and execute the configuration.

Kubernetes is a system which allows users to easily deploy and maintain their applications. In order to ensure that this functionality is provided to the users of our service, we need to develop a template that is easy to use and understand. My goal is to design a template that will accurately configure a user's Kubernetes environment without sacrificing any usability. Usability is important because we do not know what level of knowledge about Kubernetes our users will have, and thus it is important to make a template that is as easy to understand as possible. Accuracy is also very important, as if there are any faults in configuration, the user will not be able to launch

their application successfully. That is why it is important to me to create a template which accommodates these two principles. This will be my responsibility, and with the help of my team we will accomplish this task.

Sources:

- [1] Kubernetes. "Learn Kubernetes Basics." Kubernetes.
<https://kubernetes.io/docs/tutorials/kubernetes-basics/> (accessed November 7, 2021).

- [2] Red Hat. "What is Kubernetes?" Red Hat.
<https://www.redhat.com/en/topics/containers/what-is-kubernetes> (accessed November 7, 2021).

- [3] Kubernetes. "Configuration Best Practices." Kubernetes.
<https://kubernetes.io/docs/concepts/configuration/overview/> (accessed November 7, 2021).