Pivotal Interface for Kubernetes

Product Requirements Document v1

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Product Name: kubernetes konekt Team Name: The Goodfellas

1. Background

Kubernetes is a platform that is made to revolutionize the way that container based applications are released and tested. Kubernetes makes use of Docker containers that package and run an application along with all its dependencies in an isolated environment, eliminating errors experienced from running an application on different machines. Unlike a regular virtual machine, Docker containers do not need a guest operating system, making deployment lightweight.

Kubernetes builds on top of this by automating the deployment, scaling, and management of containerized applications within a cluster of computers. Through a master server, a cluster and its nodes can be managed, distributing containers among the nodes.

The lack of connectivity between users with containers and users with clusters acts as a barrier for deployment. Currently there is not an interface that streamlines connecting these two groups.

2. Project Overview

The Minimum Viable Product (MVP) will be a Web UI that will connect users all over the world and allow them to run containers on remote clusters.

3. Project Specifics

The frontend of the Web UI will consist of HTML, CSS, and JAVA elements. The backend will make use of Spring MVC framework. Spring MVC provides many of the tools for front and back end logic, taking a model, modifying data with the controller, and sending it to the view to display it to the user. The Web UI will be hosted on the Pivotal Web Service (PWS) and the database will be managed with MySQL.

The Hibernate framework is used as an object-relational mapper tool for JAVA, but it also provides other APIs. The Hibernate APIs we are using include Hibernate ORM which allows us to map class objects to table entries on a database and Hibernate Validator to validate user input has correct structure using annotation driven development.

The security of the website will make use of Spring Security. This framework streamlines user authentication and access control. This allows for easy management of user logins and registrations.

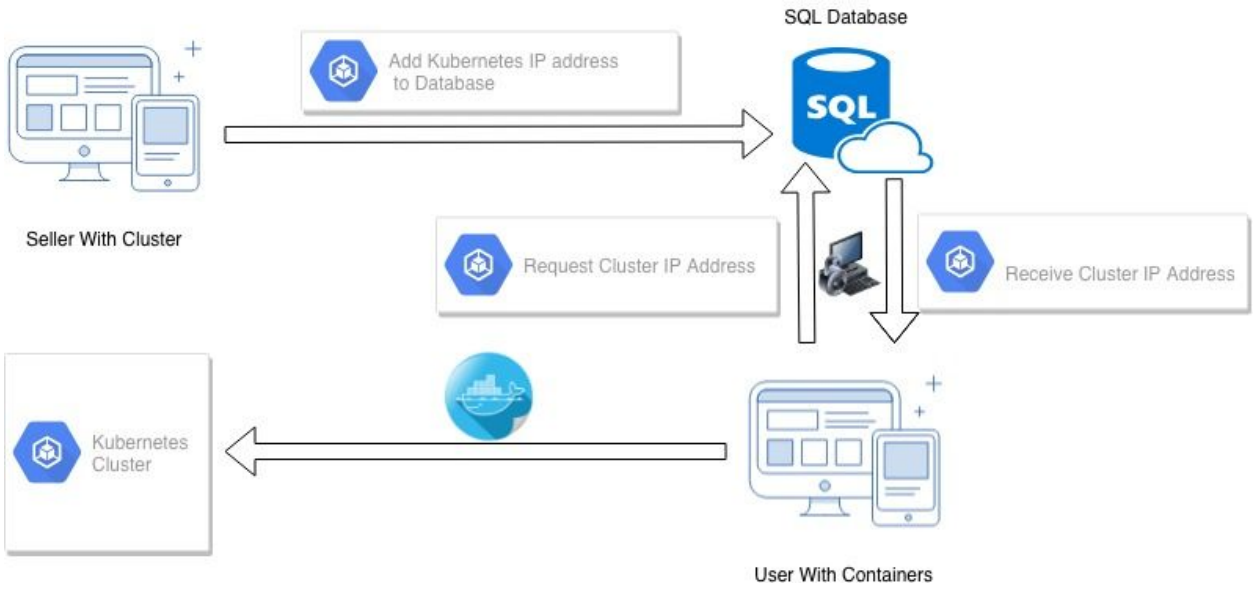
Google Cloud Platform (GCP) will be used to help with launching and testing Kubernetes for our personal use. The Kubernetes API is used to access the seller's clusters. We can easily send a commands over to the designated cluster and be able to access it.

4. Assumptions

We are assuming that users have containers that are fully functional and smoothly running. Buyers will be responsible for managing all their own containers and making sure their containers run smoothly so that sellers are able to run them on their clusters. We are also assuming that most users understand how to use Kubernetes or have a basic understanding thereof. Sellers have already set up their clusters before being listed to other users and are ready to accept containers.

5. System Architecture Overview

High Level Diagram



User Interaction and Design

Users of the service must register for either a buyer or seller account. Sellers are users that already have a kubernetes cluster running. To list their cluster onto our service, they shall fill out a form with the cluster's IP address and submit for a review. Buyers on the other hand will upload images to our server and manage them through their dashboard.

The general workflow for the buyer will consist of a uploading an image, selecting a cluster from a list of IP addresses, and submitting the request to use the cluster. The seller at this point will accept incoming requests and will automatically deploy the image onto their cluster through the Kubernetes API.

6. User Stories

USER STORY	ACCEPTANCE CRITERIA
As a buyer/seller, I can register to the website.	Scenario 1: User has is not registered. Given user has never registered before. And user is not currently logged in.

	When user fills out registration form. And user clicks submit. And account has been created. Then user will be prompted to confirm account via email. Scenario 2: User is registered. Given the user has an account. And the user is not currently logged in. When user fills out registration form. And user clicks submit Then error message will appear that account already exist.
As a buyer/seller, I can login to the website.	Scenario 1: User is registered. Given the user is not logged in And enters a valid username and password When the user clicks submit Then their dashboard is displayed And a successful login message pops up. Scenario 2: Invalid username or password. Given the user is not logged in And enters an invalid username or password When the user clicks submit Then an invalid message will appear And will be asked to re-enter their information. Scenario 3: User forgets username. Given the user is not logged in And they are registered When they click username recovery Then they will receive an email with their username And will be redirected to the login page. Scenario 4: User forgets password. Given the user is not logged in And they are registered When they click password recovery Then they will receive an email to change their password And will be redirected to the password change page.
As a seller, I can upload a cluster IP to my	Scenario 1: Seller has not listed their cluster.

account so that it can be listed publicly.	Given the seller already has a cluster running And they have their cluster IP address When the seller inputs their IP address Then the IP address is posted And a confirmation message pops up. Scenario 2: Seller has their cluster listed. Given the seller has a cluster running And they have their cluster IP address When the seller inputs their IP address Then the posting is ignored And a rejection message pops up.
As a buyer, I can upload a container image.	Scenario 1: Buyer has not uploaded their container image Given that the buyer has navigated to the storage menu And they have their container image When they upload the image Then their storage menu will update And a confirmation message pops up. Scenario 2: Buyer has uploaded container images before. Given that the buyer has navigated to the storage menu. And that they want to use an old container image. When they click on their desired image. And they click on submit. Then a confirmation message will pop up.
As a buyer, I can schedule a container image so that it can run on a cluster at a different time.	Buyer has their container image already uploaded Given that they found which cluster to work use And when they want the cluster to run the image When they schedule the cluster in their dashboard Then the request is sent to the seller And a confirmation/rejection message appears after the seller confirms/denies the request.
As a buyer, I can run a cronJob.	Seller has a cronJob and an image to run. Given that buyer has already uploaded their

	container as an image. And uploaded their cronJob file Then seller will run uploaded cronJob and uploaded image on cluster
As a user, I can remove an image.	User does not need image anymore Given that user has already uploaded an image And user no longer needs the image Then user should be able to delete image by clicking on a ‘delete image’ button And user will be prompted with a message to confirm deletion, where the user can then confirm or cancel to stop deletion
As a user, I can view my payment information on my dashboard after I have bought or sold a cluster.	User has bought/sold a cluster Given that they have navigated to their account settings And they selected the payment information option Then the user will gain access to their payment information And will be given an option to update their payment information
As a buyer, I can communicate (chat) with the cluster owner.	Scenario 1: chat between two users Given that user wants to start a chat with another user And both users have a Kubernetes Konekt account Then user can start a chat by clicking on the ‘start chat’ button And users will be connected and they will be able to chat Scenario 2: group chat Given that user wants to start a chat with other users And all users have Kubernetes Konekt accounts Then a user can start a chat by clicking on the ‘start chat’ button and add other users And users will be connected and they will be able to chat
As a buyer, I can see other available clusters that are listed publicly.	Buyer wants to browse available publicly listed clusters.

	Given that they have navigated to their dashboard And selected the available clusters option Then the user will be displayed a list of publicly listed clusters And will be given a description with information about each cluster.
As a user, I can manage my user settings on a dashboard.	User wants to change settings (email, password, payment information). Given that the user is logged into their account. And has selected the account settings. Then the user will be shown a list of settings that they can change. And they will be sent a confirmation email.

7. Appendices

What we're NOT Doing

We are not going to make this into a mobile app. Connecting users through Kubernetes would be possible through a mobile, but we want to focus on developing a web application first. We are also not creating an interface to create a Kubernetes cluster. As previously mentioned, sellers will be responsible for making their own clusters, and then using our web app to connect to other users.

List of Technologies

- **Web Stack**
    - **Java:** Main language used in creating spring based application(s).
    - **Spring Core:** IoC and Dependency Injection features.
    - **Spring MVC:** Model-View-Controller (MVC) architecture and components that can be used to develop flexible and loosely coupled web applications.
    - **Spring Security:** Authentication, authorization and other security features for enterprise applications.
    - **Hibernate ORM / Validator:** Object-relational mapper tool and validates user input.
    - **MySQL:** Relational database management system.
- **Cluster Stack**
    - **Minikube:** Local cluster service.
    - **Pivotal Container Service (PKS):** Deploy and run containerized workloads across private and public clouds.
    - **Google Cloud Platform (GCP/GKE):** Series of cloud services including cluster management for running your Docker containers.