Project Plan
Kubernetes Cluster Inspection Tool

The Capstone Experience

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Functional Specifications

• Provide Robust Inspection Tool of Kubernetes Cluster
  ▪ Both Current and Historical State
• Gather All Cluster Data into Single Interactive View
  ▪ Provide Health, Performance, and Resource Changes
  ▪ Ingest with Kubernetes Stackdriver Agent
  ▪ Trace Lifecycle of Nodes, Pods and Containers
• Implement Easily on Any GCP Kubernetes Cluster
Design Specifications

• Reactive Single Page Application
• Cluster Visualization
  ▪ Monitoring and Logging
    ○ Grafana Dashboard
  ▪ Pod-to-Pod and Service-to-Service Communication
• Historical View Playback
• Focus: Assist Cluster Troubleshooting
• Material Design Framework
Screen Mockup: Interactive Cluster Map
Screen Mockup: Drilldown Monitoring View
Screen Mockup: Drilldown Logging View
Screen Mockup: Pod to Pod View

Kubernetes Visualization

Cluster k8s-cluster-1

- Pod 1
- Pod 2
- Pod 3
- Pod 4

Node 1

Master Node

Node 2

pod-1 to pod-2

Pod to Pod Logs

- Pod 2 received 2kb from Pod 1
- Pod 1 sent 2kb to Pod 2
- Pod 2 received 4kb from Pod 2
- Pod 1 received error 500 while trying to reach Pod 1
- Pod 2 received 2kb from Pod 1
- Pod 2 received 2kb from Pod 1
- Pod 2 received 2kb from Pod 1
- Pod 2 received 2kb from Pod 1
- Pod 2 received 2kb from Pod 1
Technical Specifications

• Web Application
  ▪ Metrics and Logging Visualization Dashboard
  ▪ Interactive Cluster Map and Events Timeline

• Pod-to-Pod Communication Tracker
  ▪ Daemon Set on each node in the cluster
  ▪ RESTful API for the web app to access the data
System Architecture
System Components

• Frontend
  ▪ Vue.js
  ▪ Grafana
  ▪ D3.js

• Backend
  ▪ Go

• Software Platforms / Technologies
  ▪ Kubernetes
  ▪ Stackdriver APIs
    o Monitoring
    o Logging
    o Fluentd and Prometheus
Risks

• Feasibility of Pod-to-Pod Communication Monitoring
  ▪ Description: There is no other product on the market that is able to achieve this feature – not sure if it is even possible
  ▪ Mitigation: Adding a Daemon Set to each node in the cluster

• Cost Effective Data Caching Algorithm
  ▪ Description: Making calls to the Stackdriver API racks up a charge
  ▪ Mitigation: Data obtained from the APIs will be stored in a cache for easy retrieval

• Unfamiliarity with Needs of the End User
  ▪ Description: No one on the team uses Kubernetes in our daily lives, can’t easily anticipate what features would be most useful
  ▪ Mitigation: Reach out to Kubernetes users for feedback and input

• Playback Button to See Historical Cluster Events
  ▪ Description: Not sure if this feature is possible with available technology
  ▪ Mitigation: Use other applications with similar features as a model, and do some testing of this feature on a small scale using javascript
Questions?