MICHIGAN STATE UNIVERSITY

Project Plan

Kubernetes Cluster Inspection Tool

The Capstone Experience

Team Google

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Spring 2019

From Students…
…to Professionals

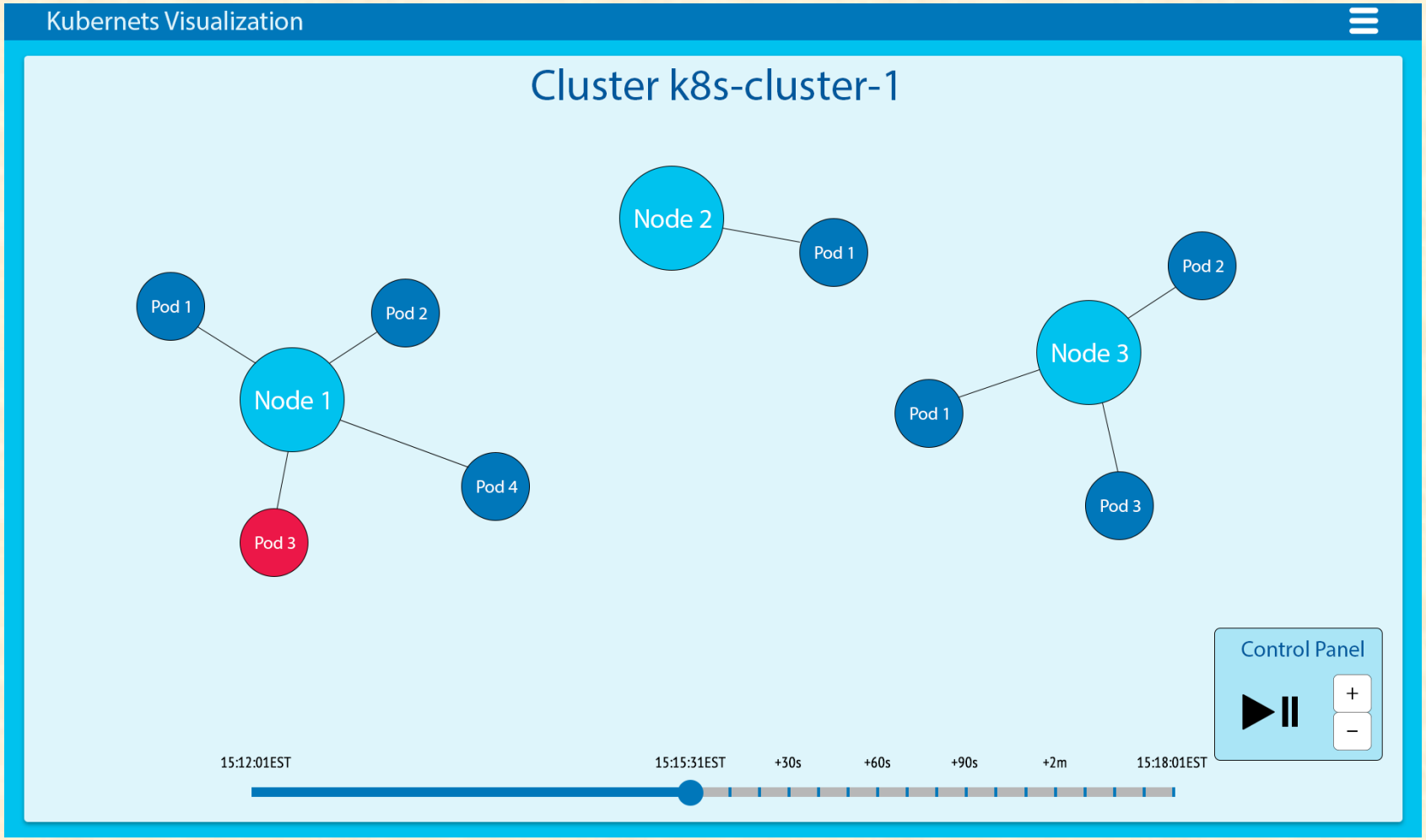
Functional Specifications

- 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

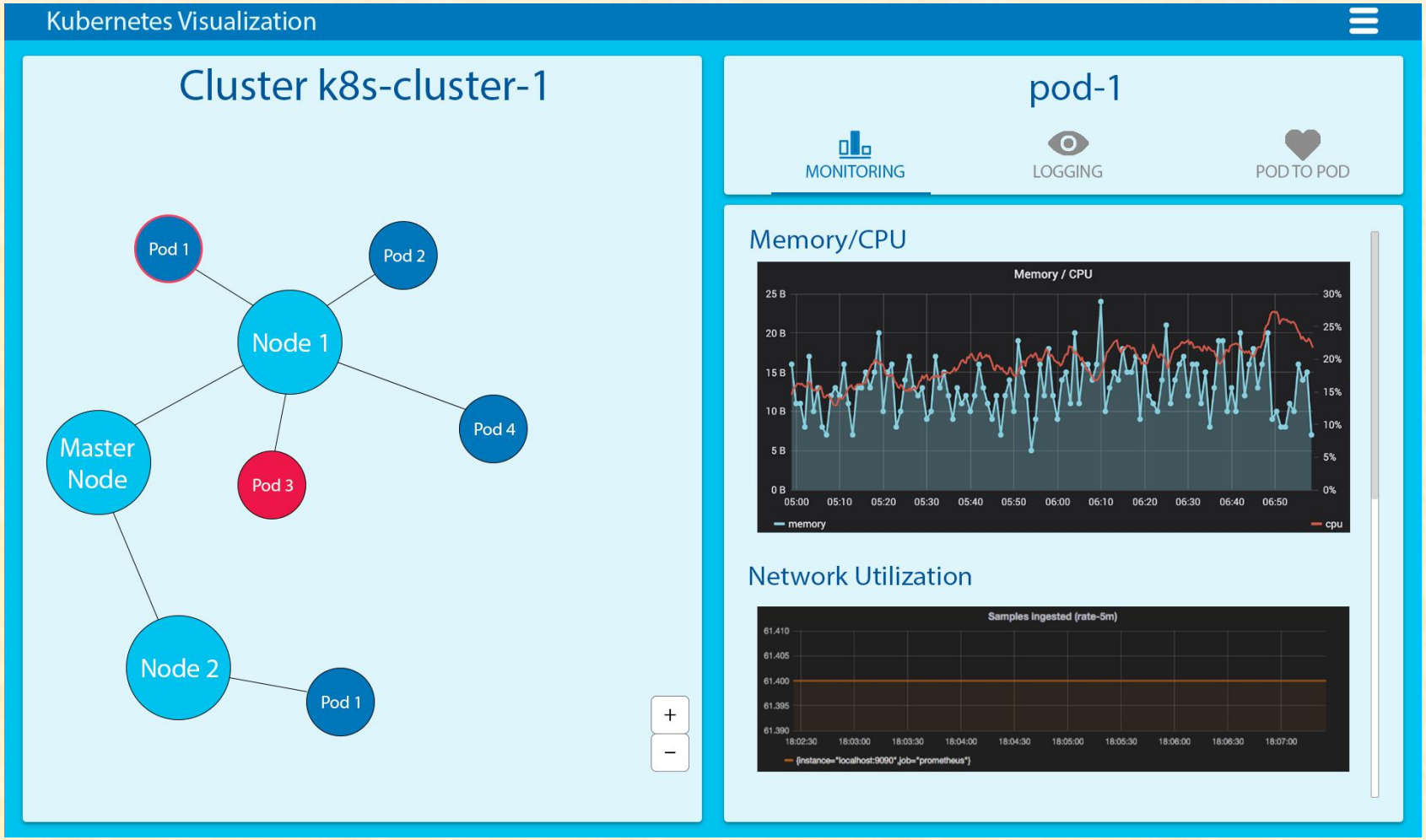
Design Specifications

- 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

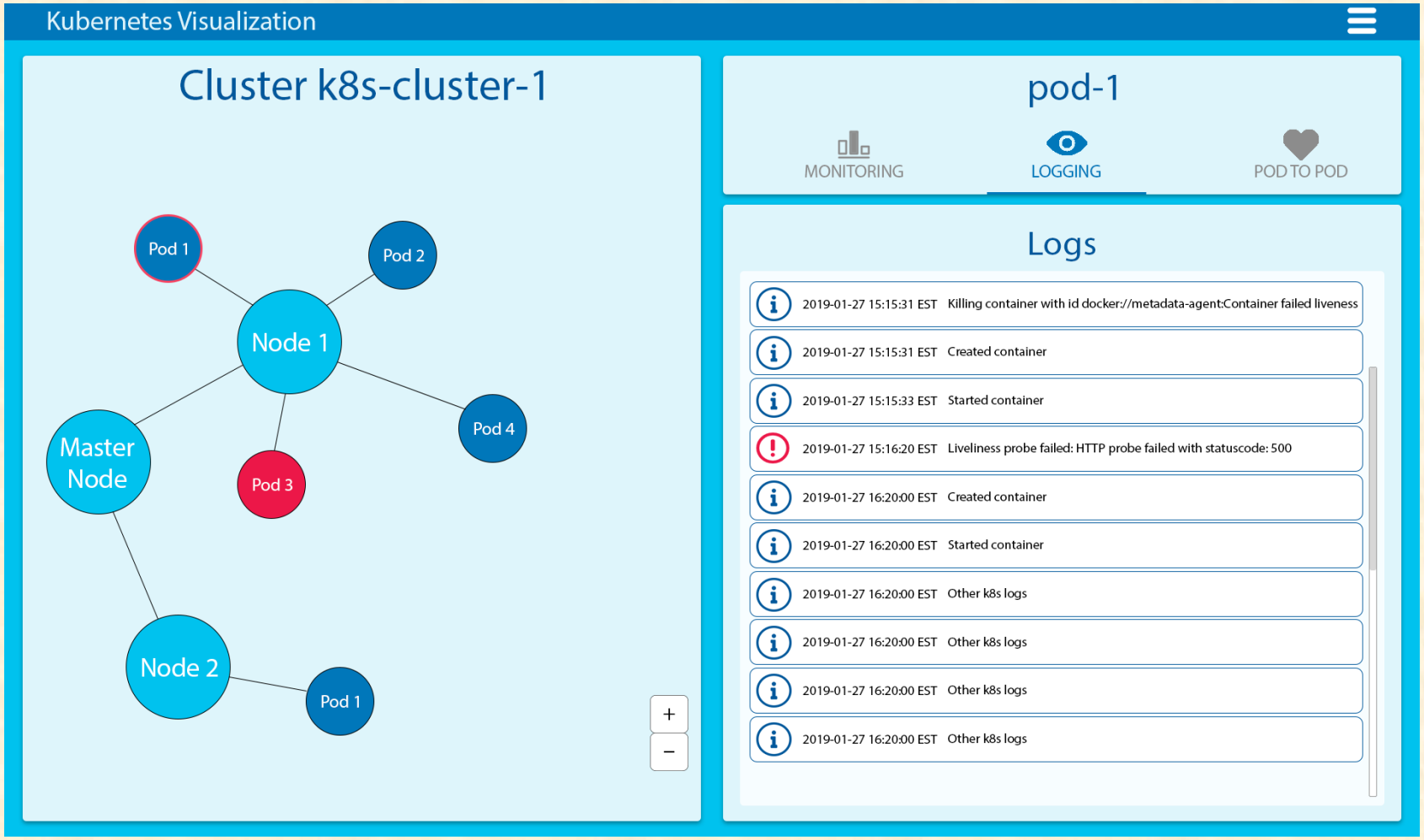
Screen Mockup: Interactive Cluster Map



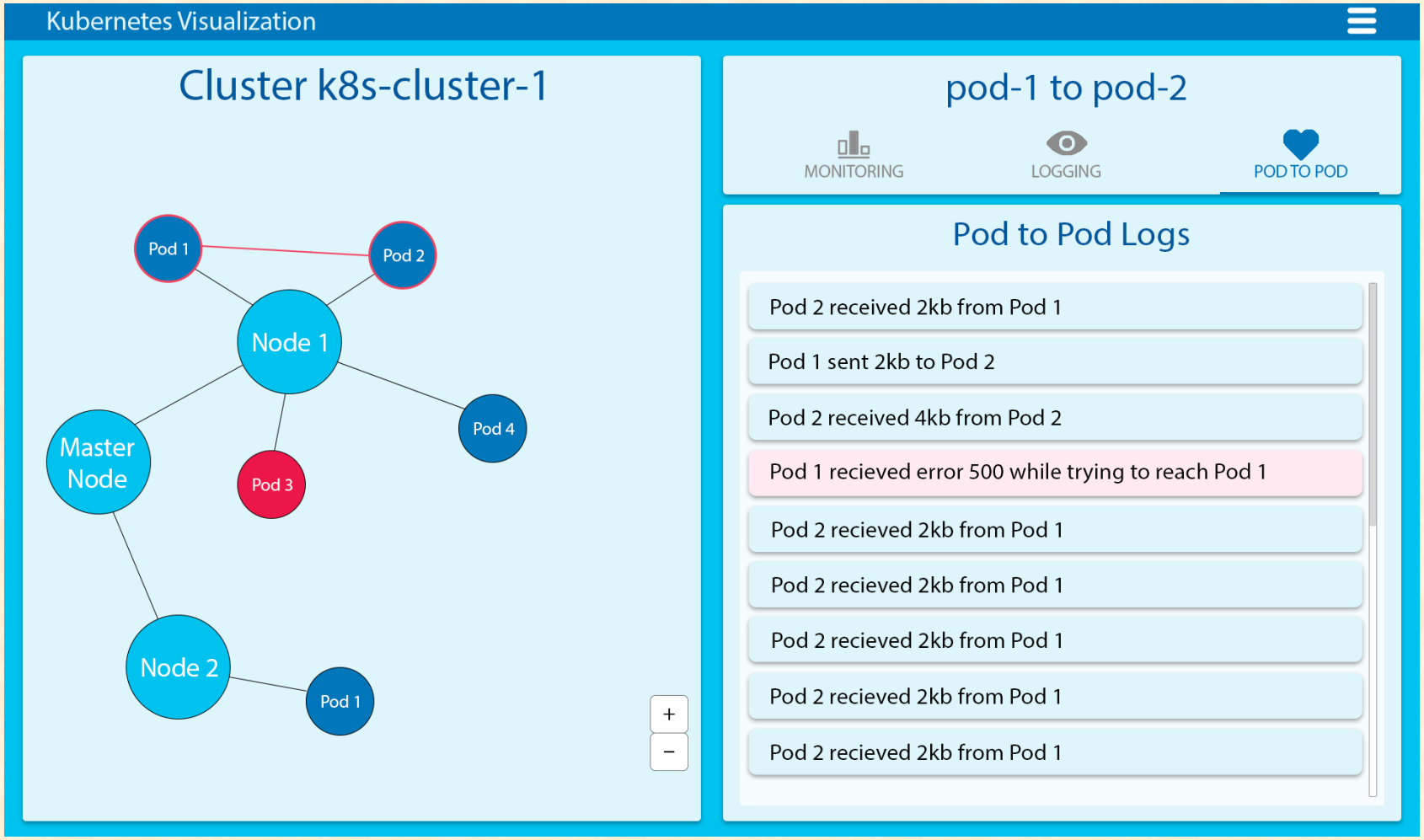
Screen Mockup: Drilldown Monitoring View



Screen Mockup: Drilldown Logging View



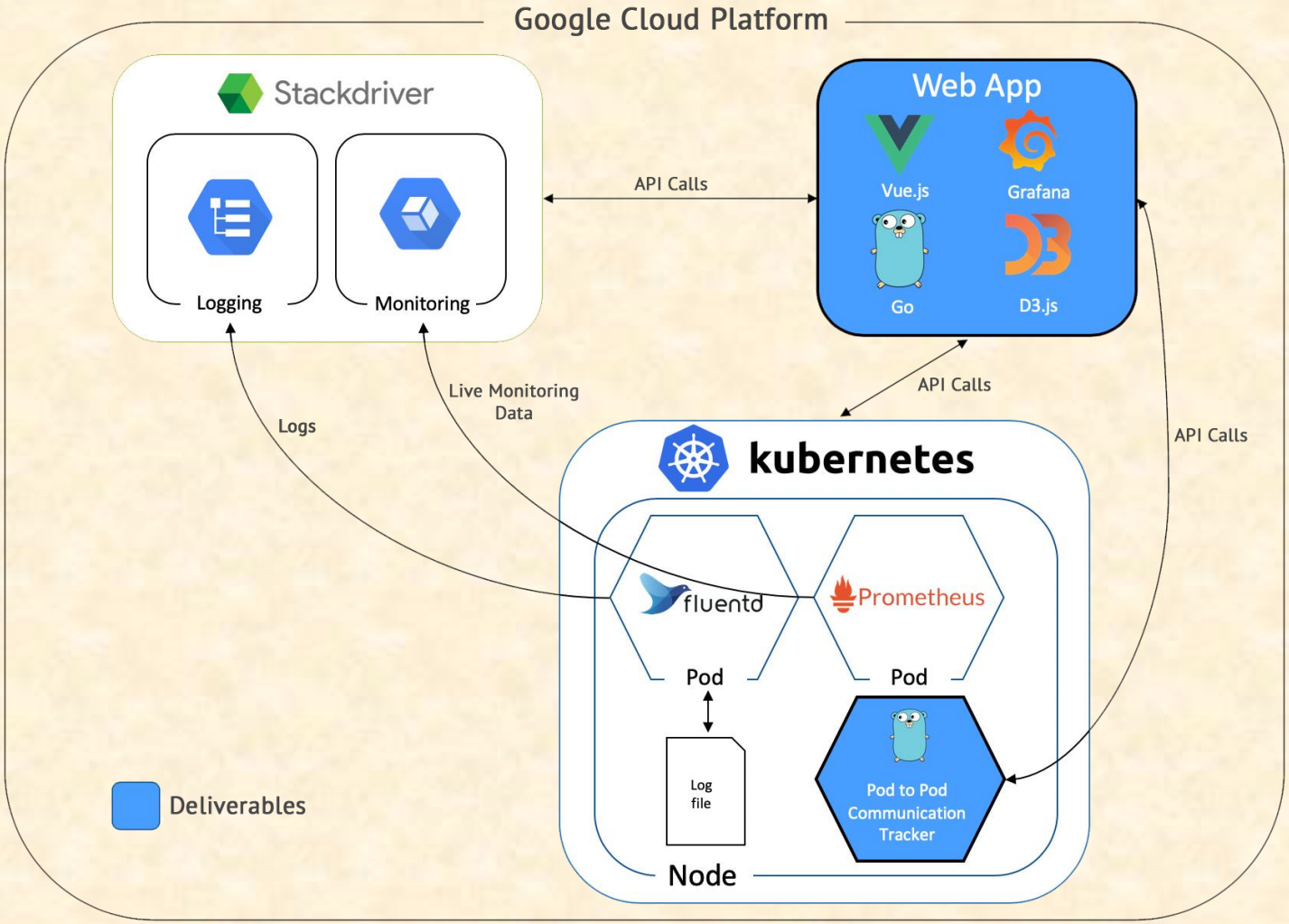
Screen Mockup: Pod to Pod View



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
    - Monitoring
    - Logging
    - 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?