

High Level Design Review

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□ High Level Design v1.1 Release

PARTNERS FOR ADVANCED TRANSPORTATION TECHNOLOGY
INSTITUTE OF TRANSPORTATION STUDIES
UNIVERSITY OF CALIFORNIA, BERKELEY

Connected Corridors: I-210 Pilot Integrated Corridor Management System

Core System High-Level Design

April 25, 2018
v 1.1 DRAFT



Partners for Advanced Transportation Technology works with researchers, practitioners, and industry to implement transportation research and innovation, including products and services that improve the efficiency, safety, and security of the transportation system.



Agenda

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- **Scope**
- **Review**
 - ▣ Key Elements and Concepts
 - ▣ Design Walkthrough
- **Comments and Responses**
- **Questions?**





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Scope

High Level vs. Detailed Design

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□ High Level Design

- ▣ System Architecture
- ▣ Primary Components
- ▣ Data Flows
- ▣ Processes
- ▣ Databases
- ▣ Primary Interfaces

□ Detailed Design

- ▣ Component Architecture
- ▣ Interface Details/Design
- ▣ DB Schemas
- ▣ AWS Design
 - EC2
 - Security
 - Services





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Key Elements

Key Elements

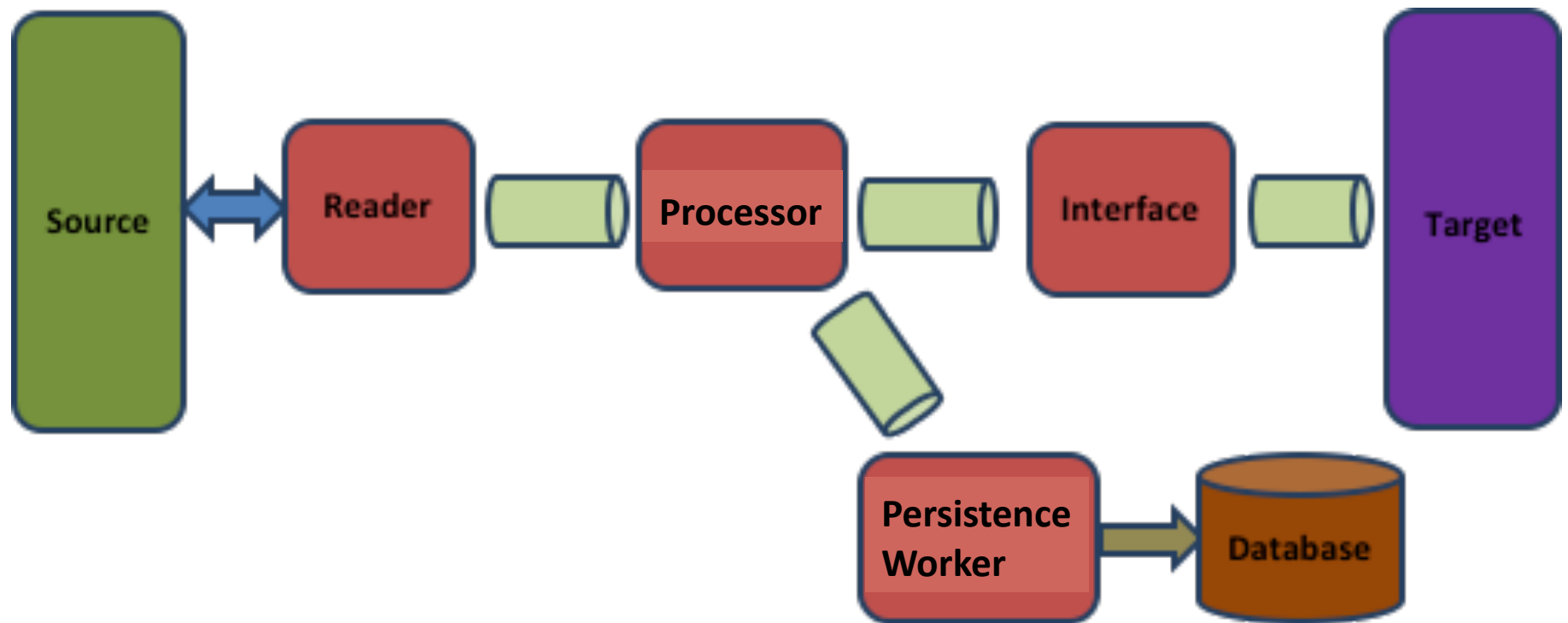
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- **Microservices Architecture**
- **Amazon Web Services**



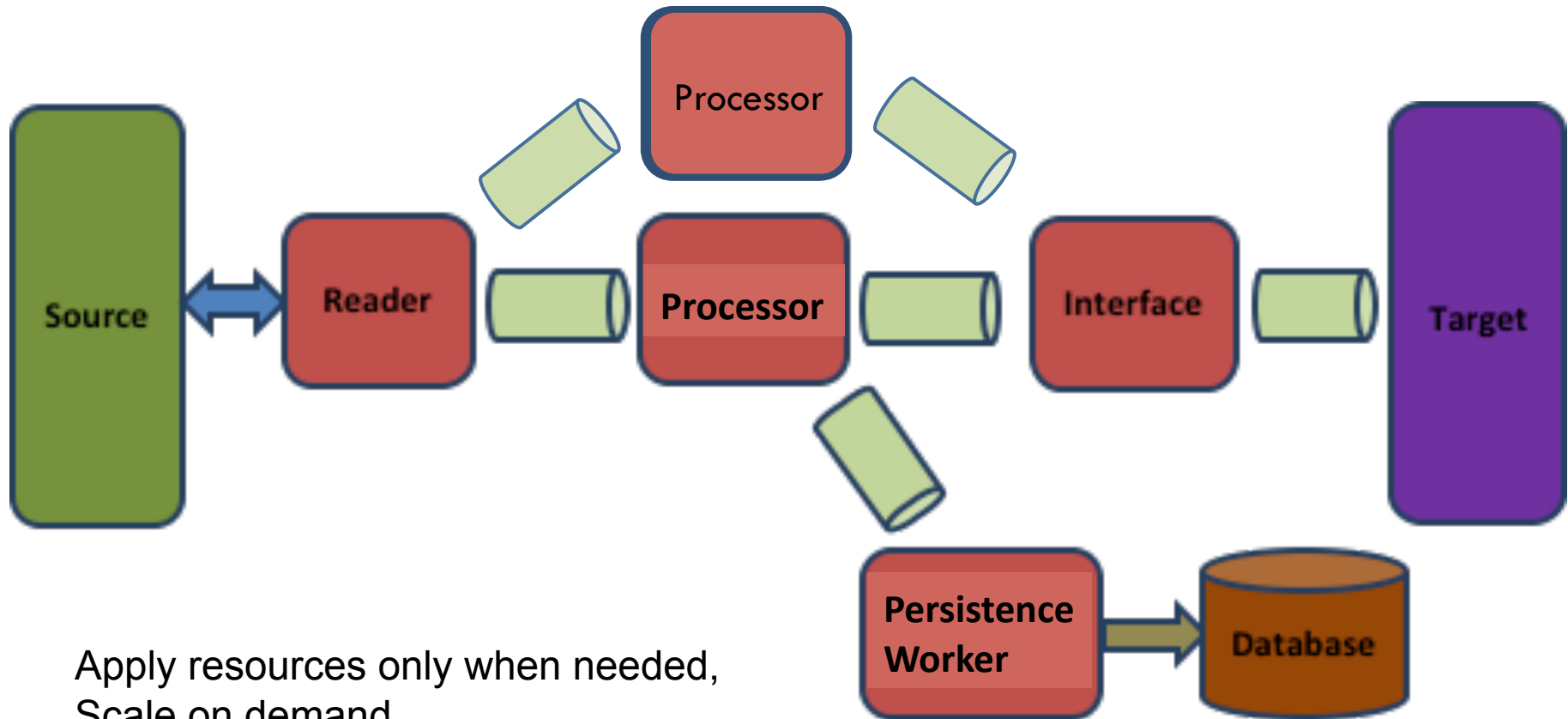
Microservices

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Microservices

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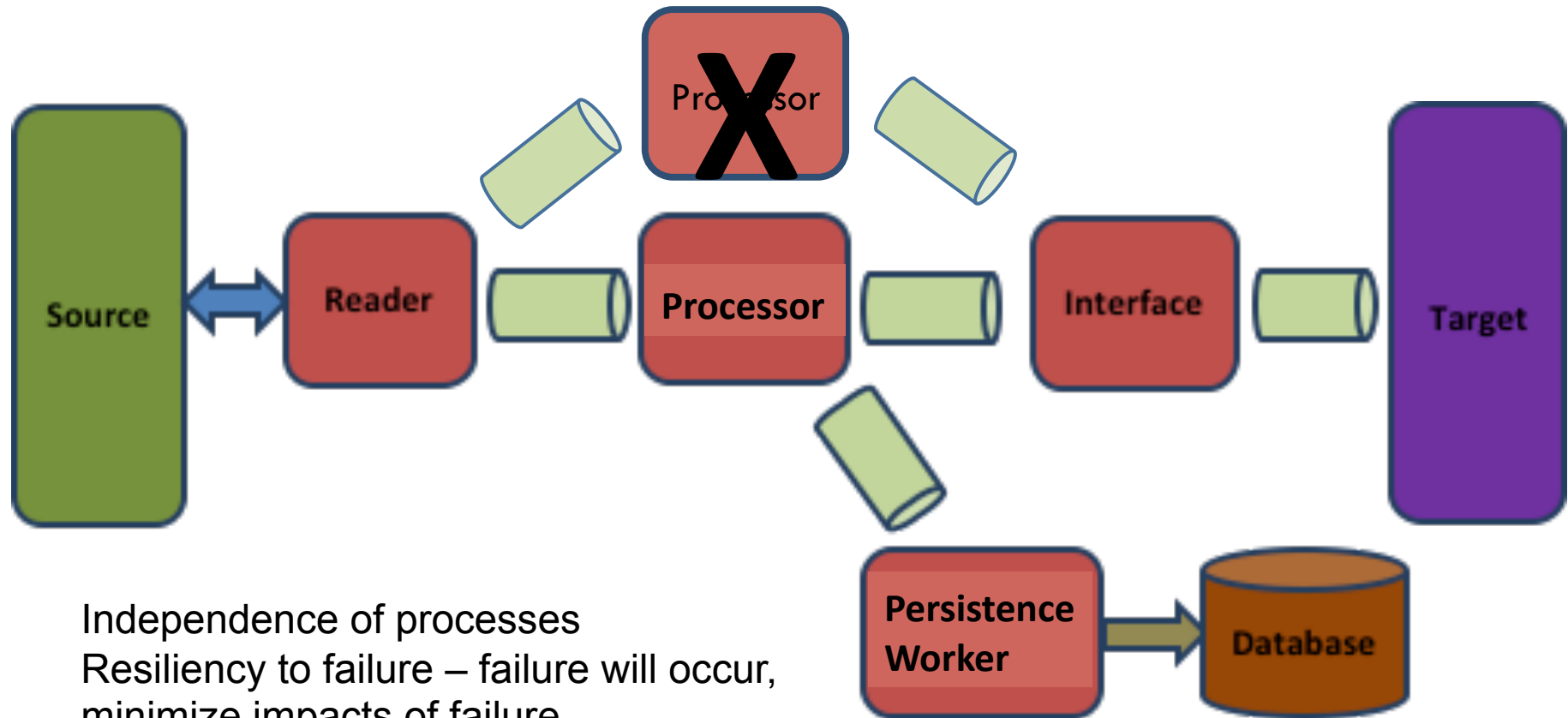


Apply resources only when needed,
Scale on demand
Scale only where needed
Speed - near real time performance



Microservices

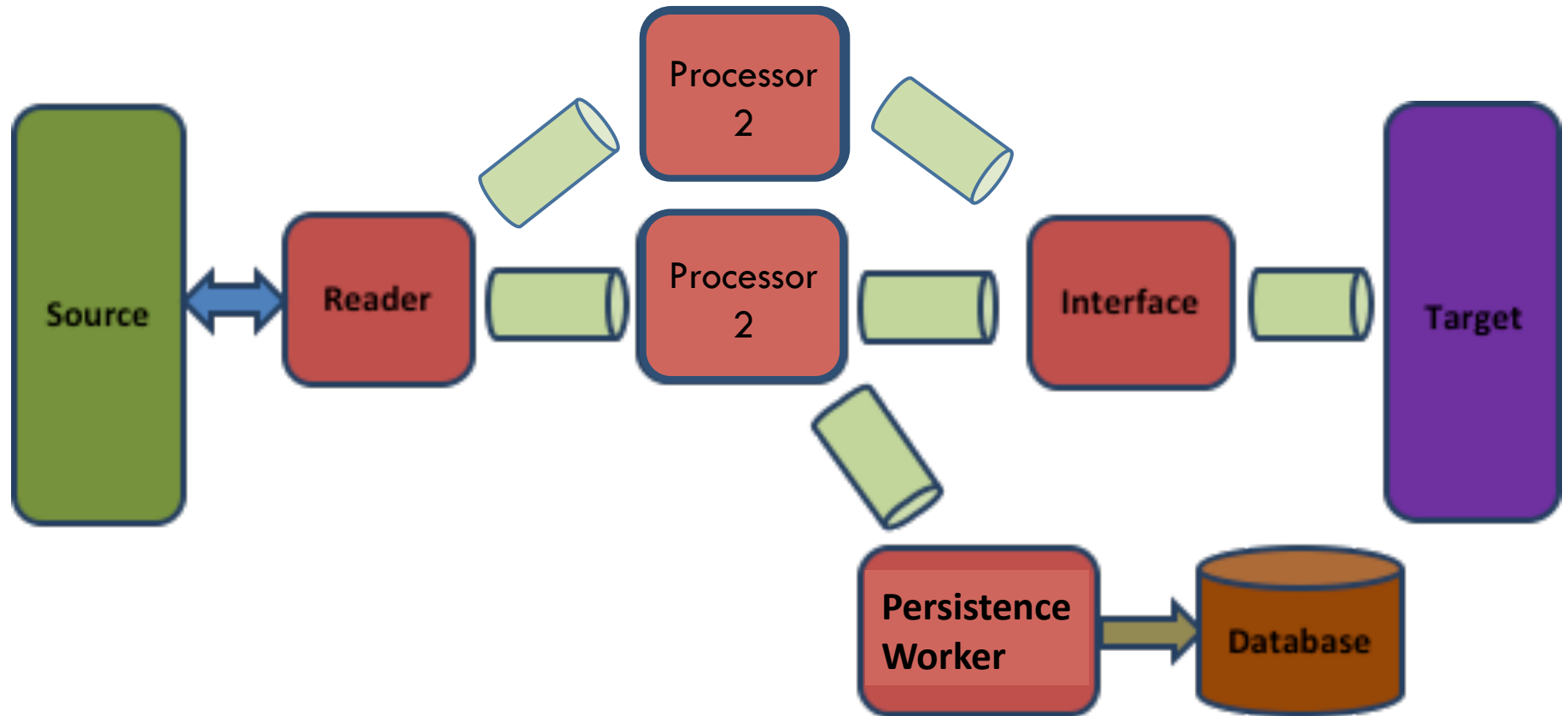
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Independence of processes
Resiliency to failure – failure will occur,
minimize impacts of failure
Security of individual processes, least
privilege

Microservices

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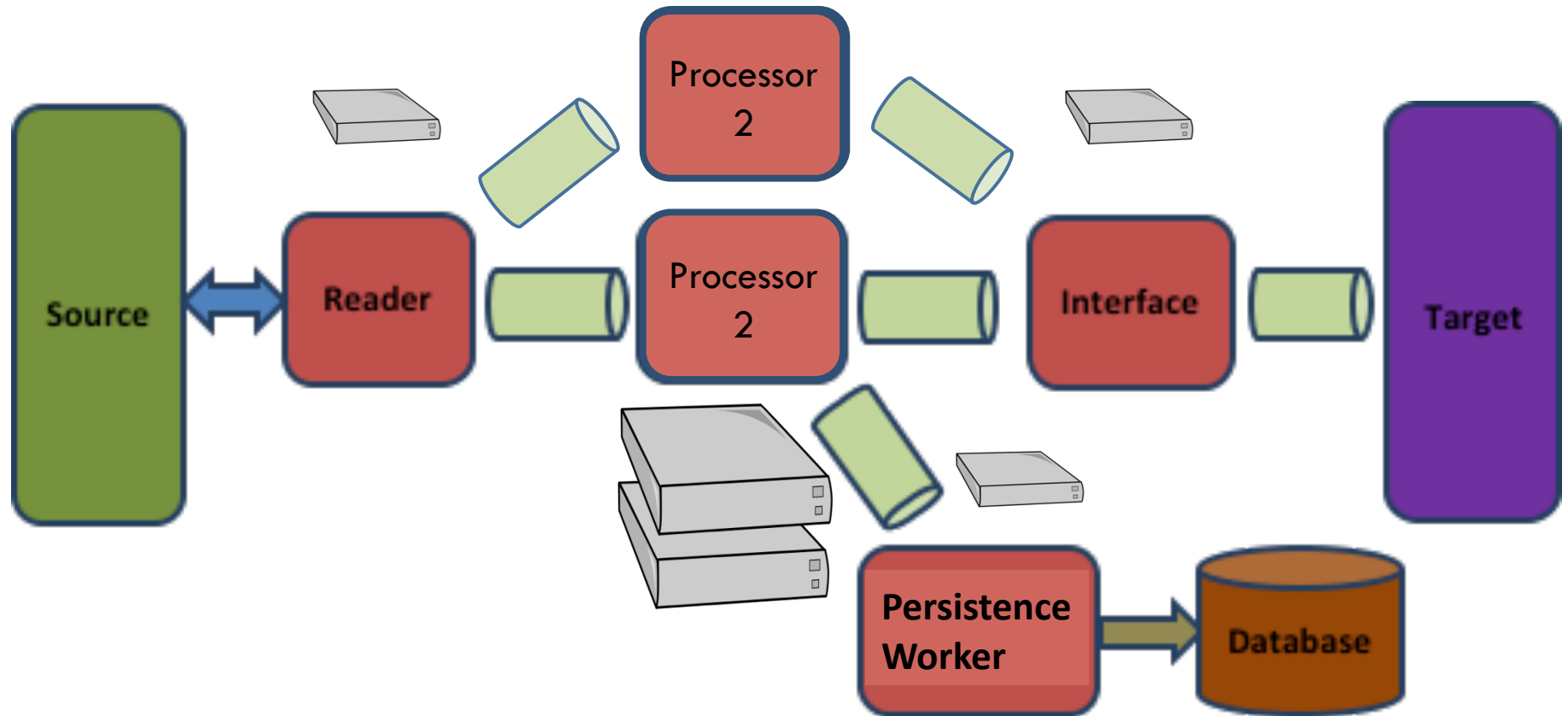


Upgrade system components with minimal impact to system



Microservices

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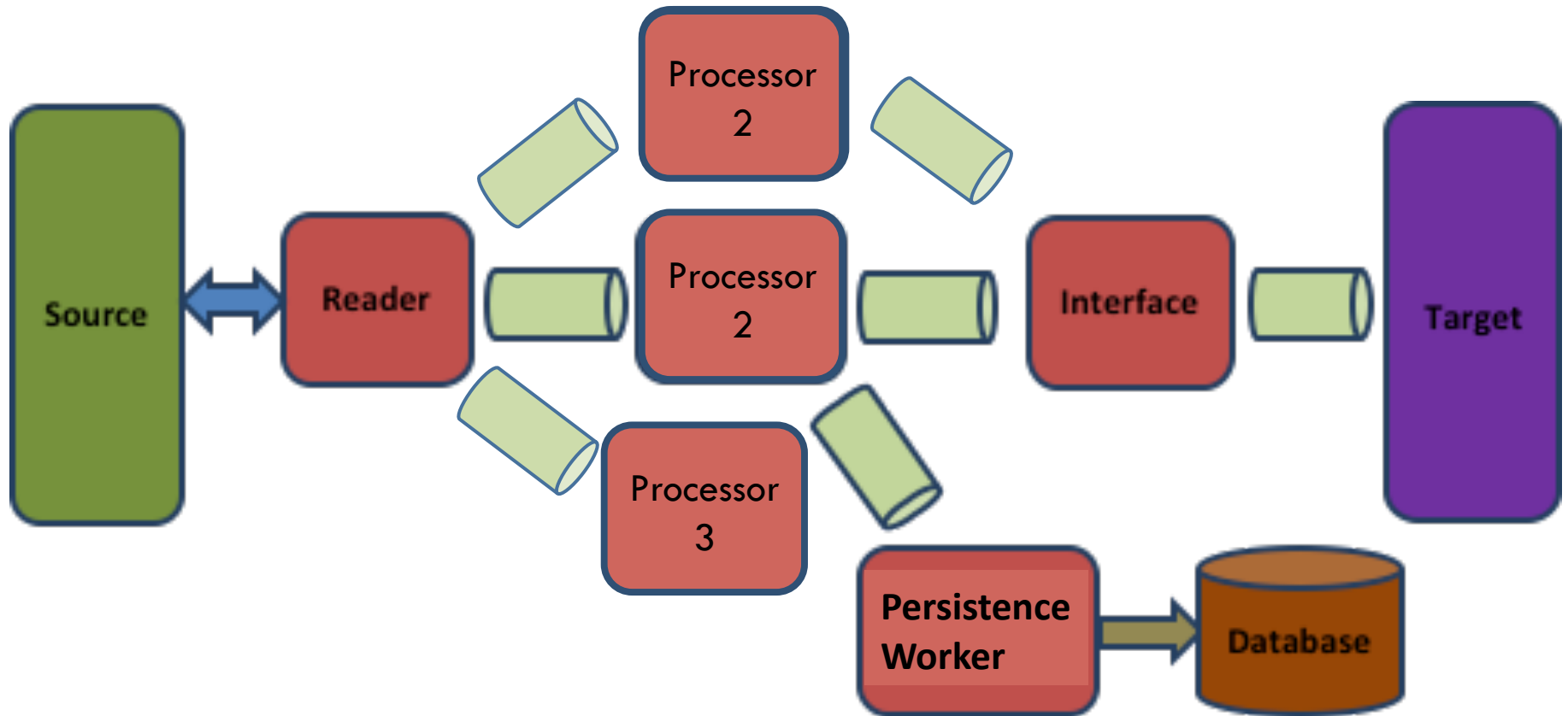


Cost efficiency/optimization



Microservices

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Flexible – add new services with limited impact



Amazon Web Services



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□ Flexibility

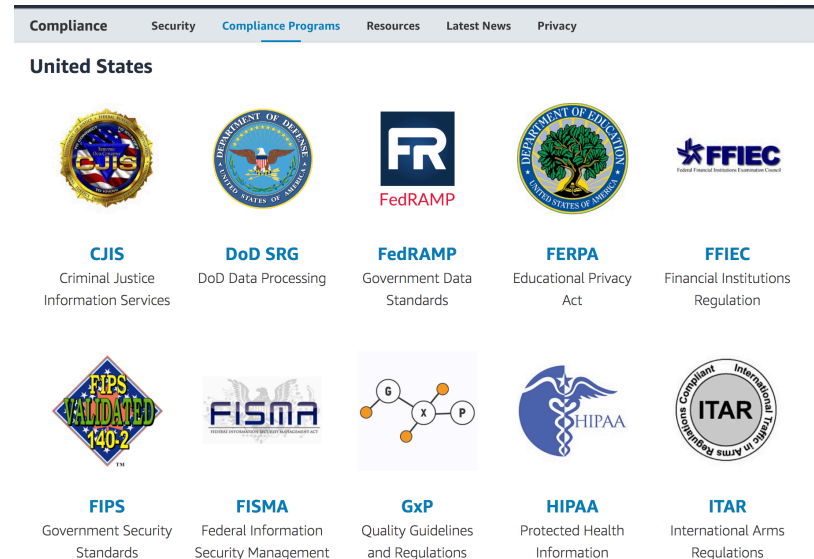
□ Ability to scale

- ▣ Scale as needed
- ▣ Add new corridors
- ▣ Add new components/functions

□ Security

- ▣ Certifications (<https://aws.amazon.com/compliance/programs/>)
- ▣ Granular control

□ Large selection of production tested capabilities



AWS Services



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- ❑ **Strategy – use commodity services available outside of AWS whenever possible, strategically use AWS specific services that provide significant development time savings**
- ❑ **Compute (EC2, EBS)**
- ❑ **EMR (Spark)**
- ❑ **RDS (Postgres)**
- ❑ **Development Tools**
(CodeCommit, CodeBuild, CodeDeploy, Code Pipeline)
- ❑ **Networking and Security**
- ❑ **Monitoring**
- ❑ **Deployment**





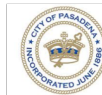
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Design Walkthrough

Objectives, Constraints, and Principles

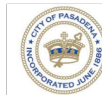
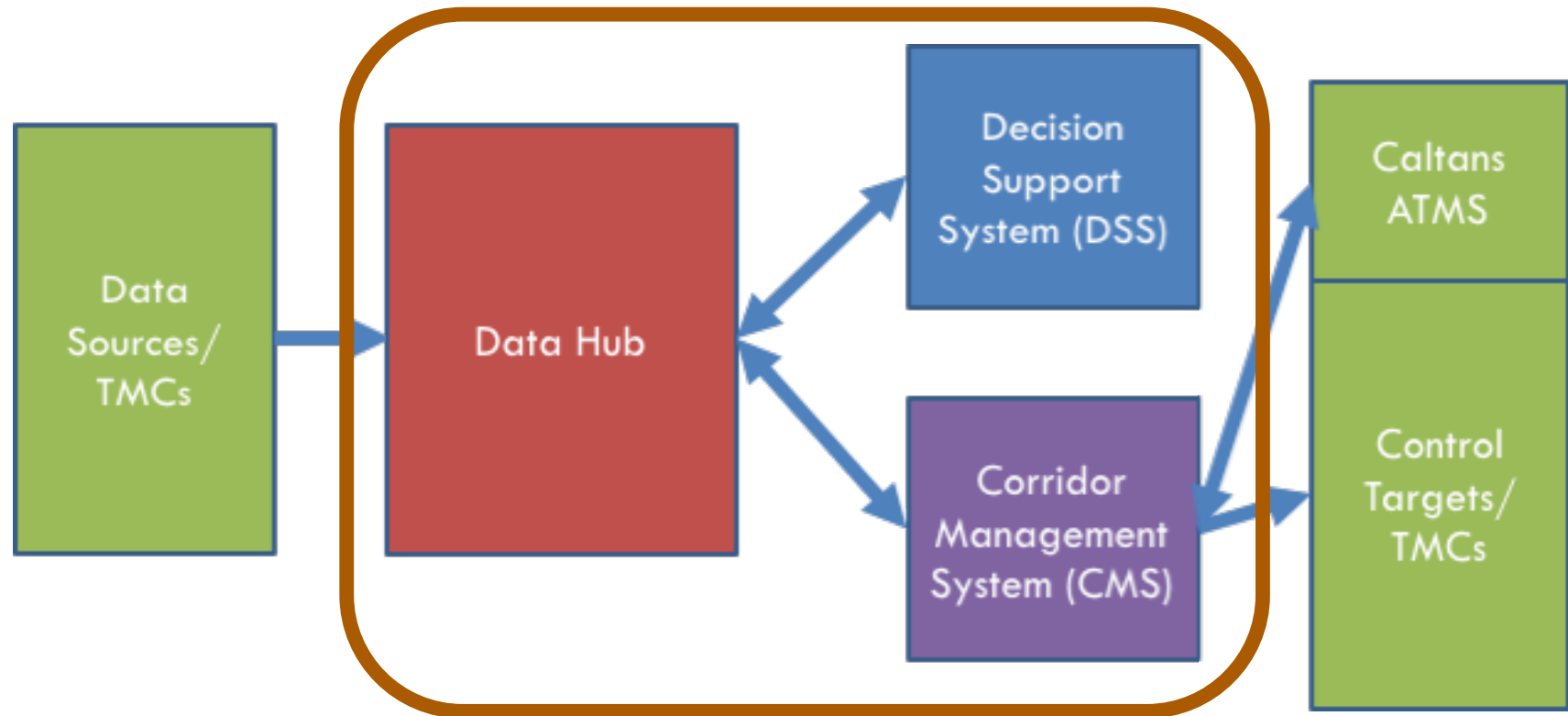
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- ❑ **Real time operation**
- ❑ **Speed to decision**
- ❑ **Flexibility for future with incremental improvements**
- ❑ **Security**
- ❑ **Maintainable, operable by Caltrans**
- ❑ **Scalable**
- ❑ **Resilient, reliable**



Core System High Level Design

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Data Hub Functions

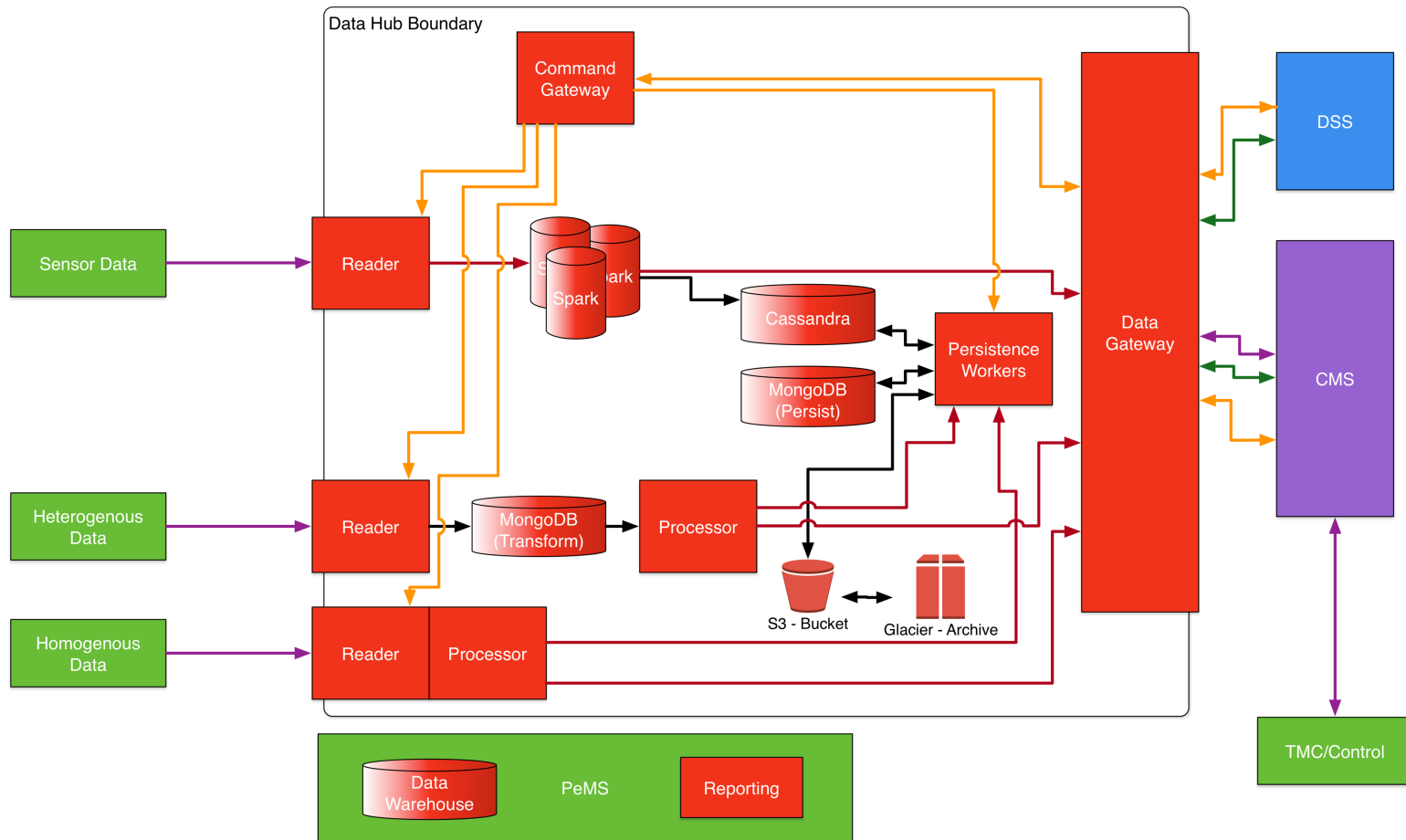
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- ❑ **Receive information**
- ❑ **Process information**
 - ▣ Data Quality
 - ▣ Common Metrics/Analysis
 - ▣ Predictive Analytics
 - ▣ Standardized formatting/content
- ❑ **Persist information**
- ❑ **Secure information**
- ❑ **Provide data communications bus**
- ❑ **Orchestration of services between the DSS and CMS**



Data Hub High Level Design

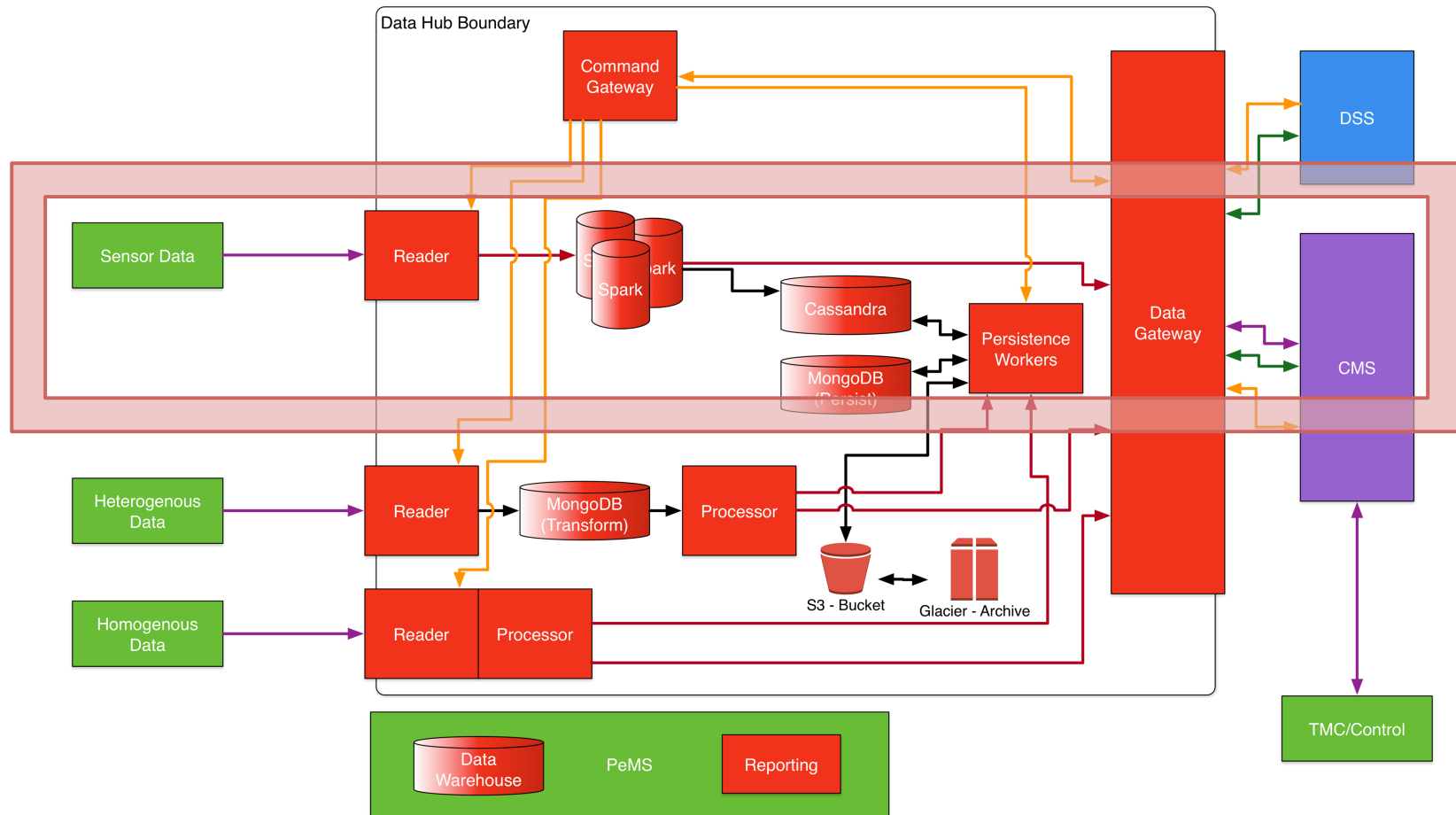
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Data Hub High Level Design

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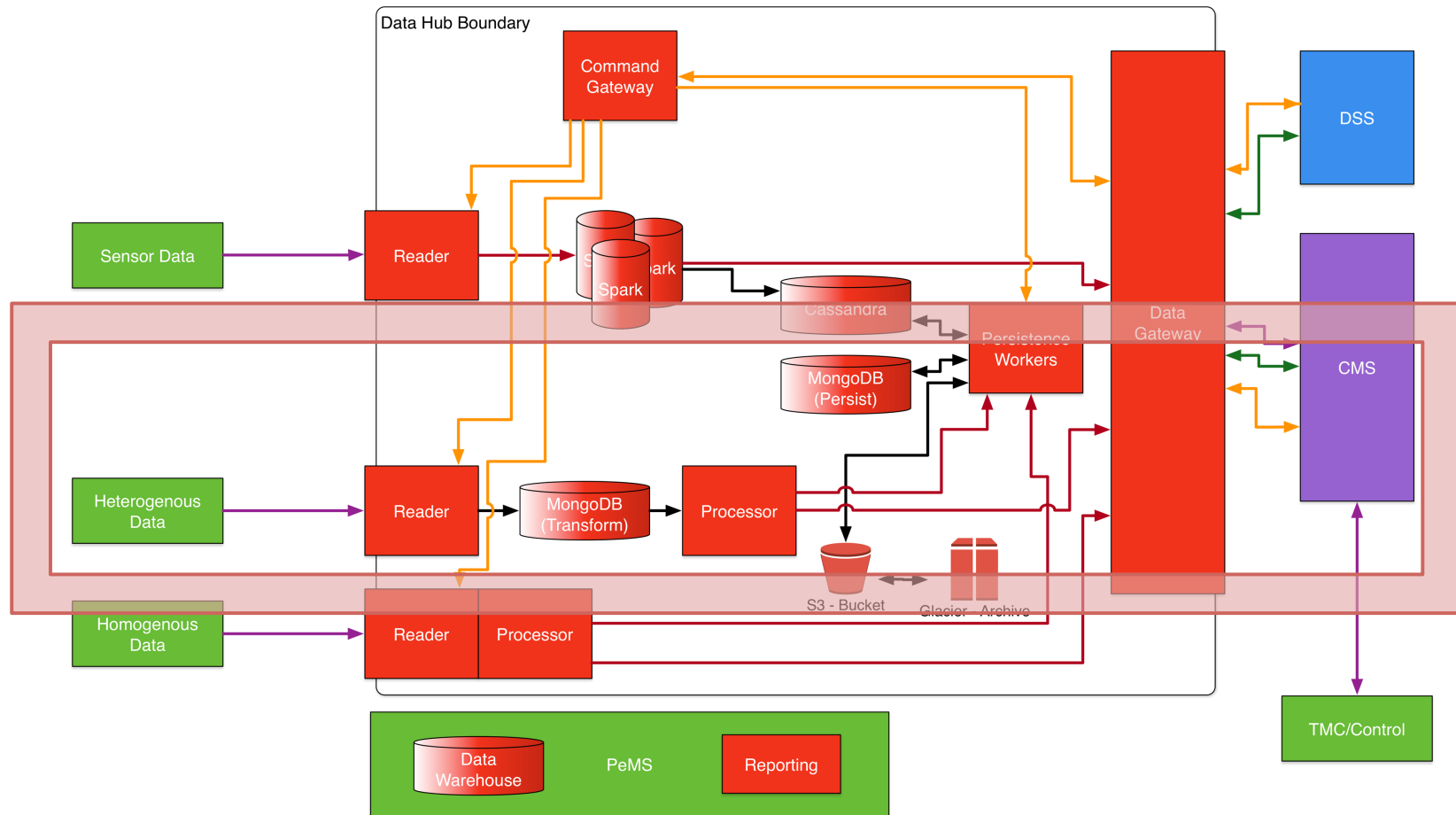
-  Kafka
-  Native/Direct
-  Control (ActiveMQ)
-  SOAP
-  Data ActiveMQ



Data Hub High Level Design

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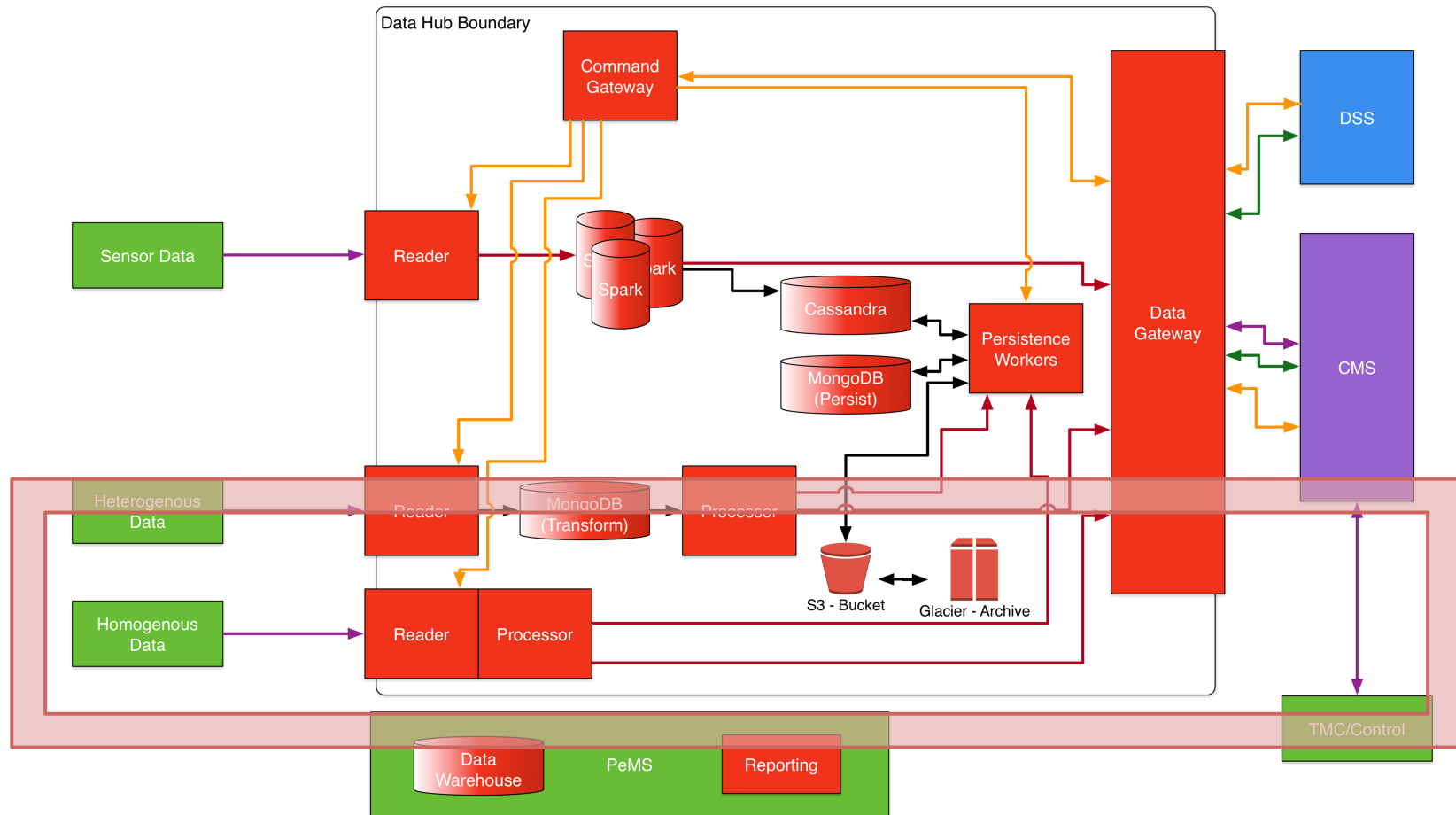
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Data Hub High Level Design

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-  Kafka
-  Native/Direct
-  Control (ActiveMQ)
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DSS Functions

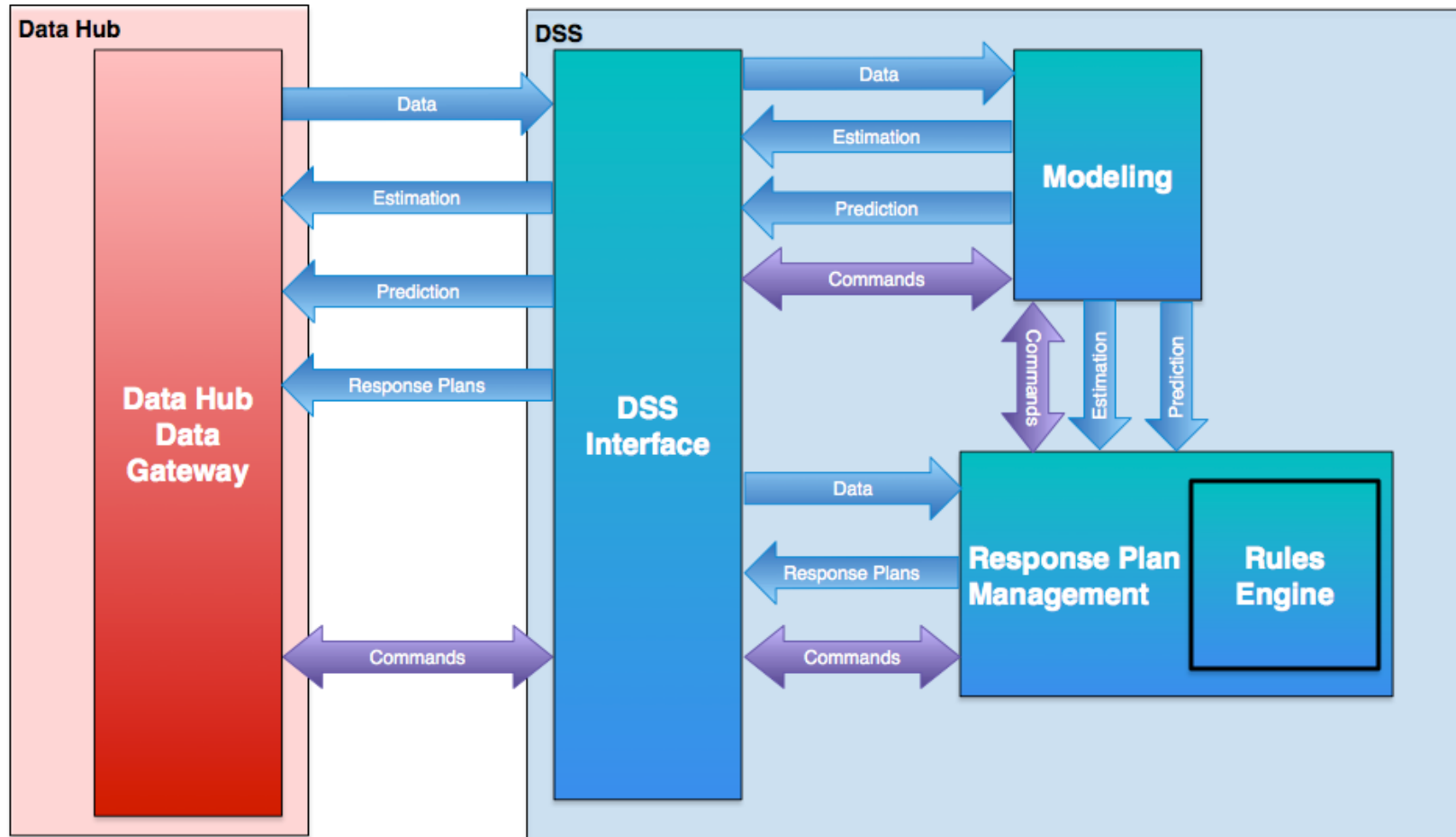
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- ❑ **Provide response plans**
- ❑ **Evaluate response plans**
- ❑ **Provide one or more recommendations to corridor operators**
- ❑ **Provide response plan evaluation results to the Corridor Management System**
- ❑ **Recommend response plan updates when appropriate**



Decision Support System Design

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Corridor Management System

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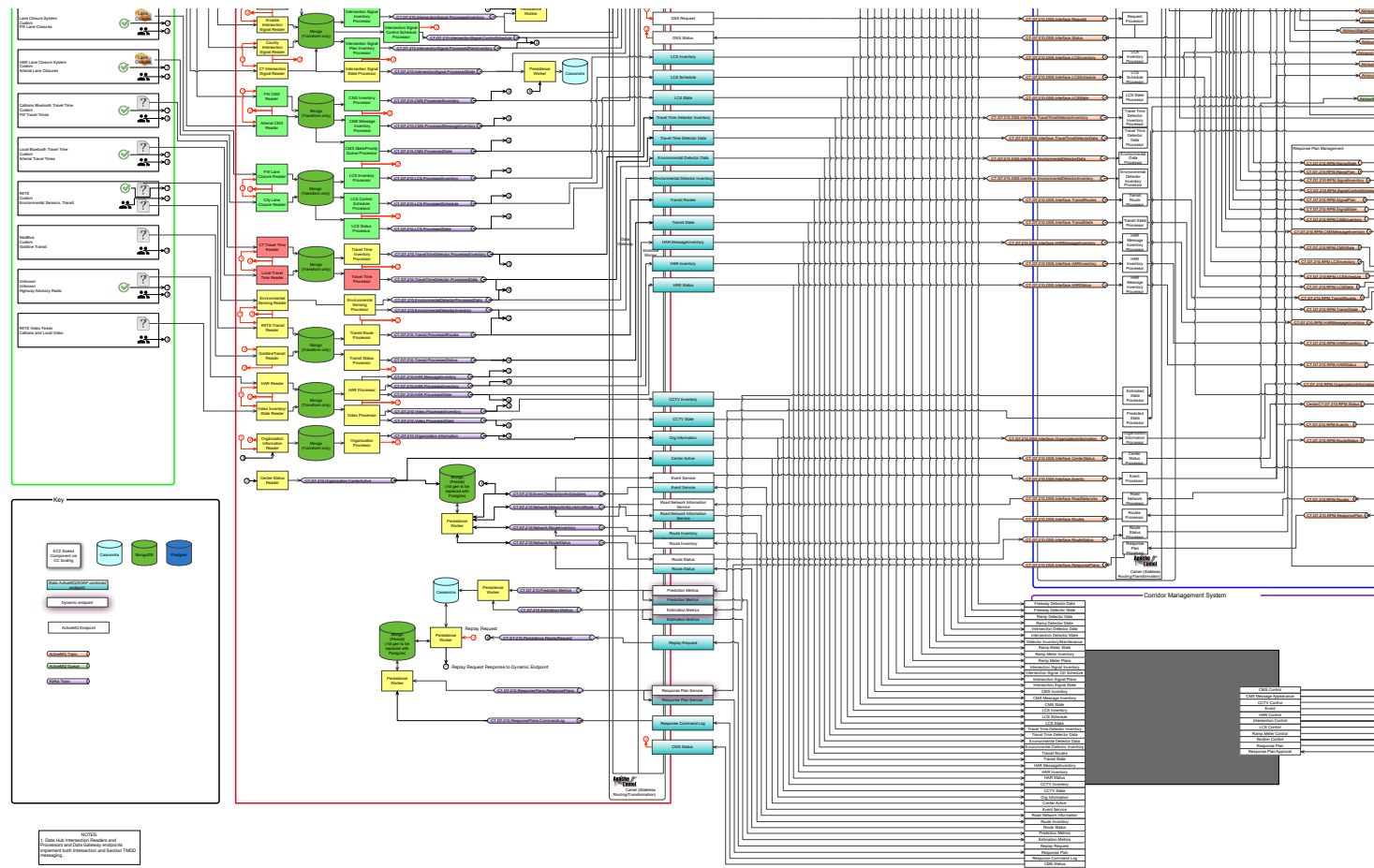
□ Primary Functions

- ▣ Capture or receive incident information
- ▣ View corridor status – assets and traffic
- ▣ Review response plans
- ▣ Manage response plan lifecycle – receive, select, approve, execute, update, terminate
- ▣ Send commands to execute response plan elements to local TMC systems
- ▣ Reporting/Review/Analytics



Details

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Details

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□ System Interface Design Specification

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Connected Corridors: I-210 Pilot Integrated Corridor Management System

System Interface Design Specification

April 27, 2018
Version 1.1 [DRAFT AS OF 4/27 11:08AM]



Information Resources

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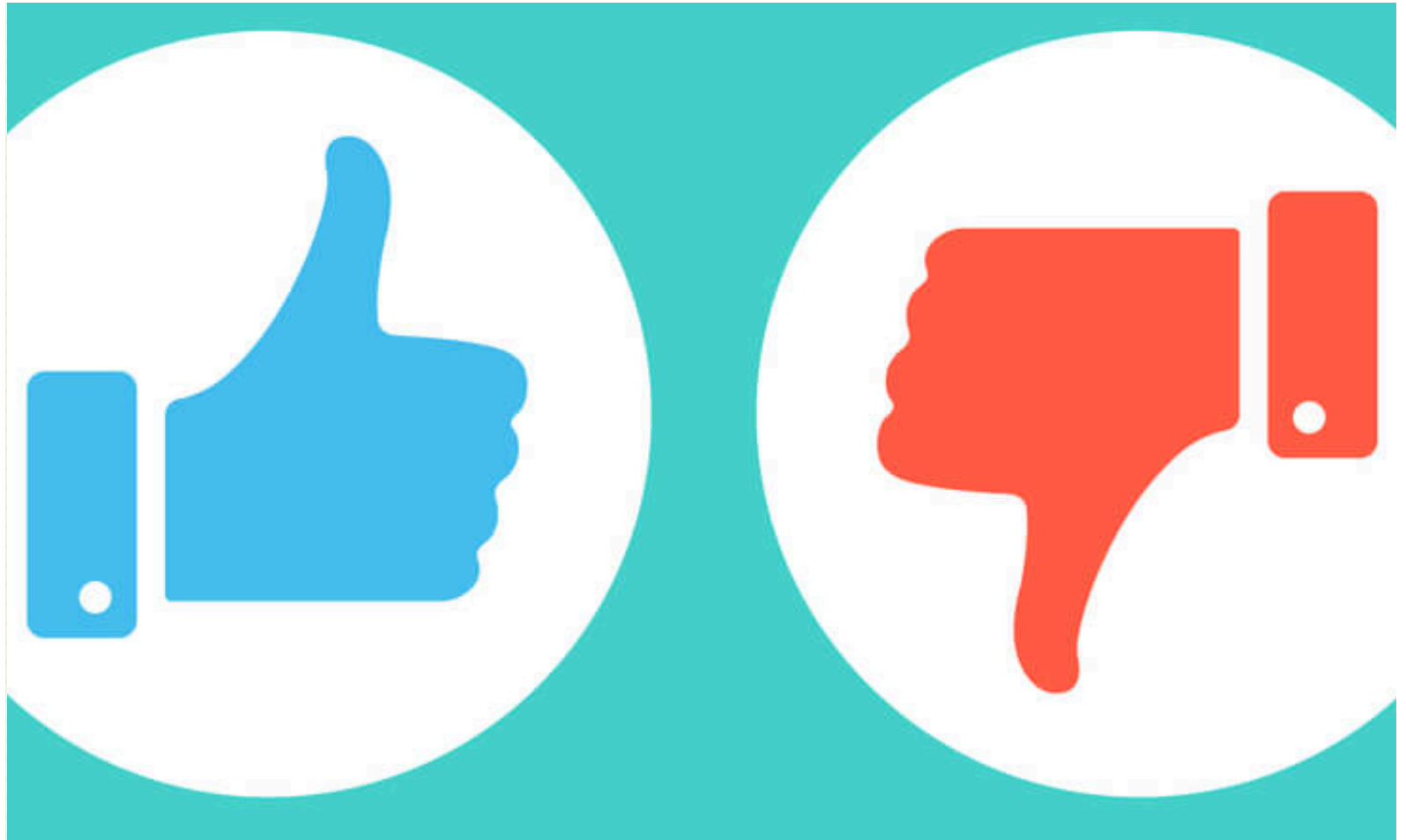
- **Project information** <https://connected-corridors.berkeley.edu>
- **Documentation library**
<https://connected-corridors.berkeley.edu/resources/document-library>
- **Team share drives available – released and pre-release development documentation**
- **brian.peterson@berkeley.edu**



Questions

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Comments and Responses Review