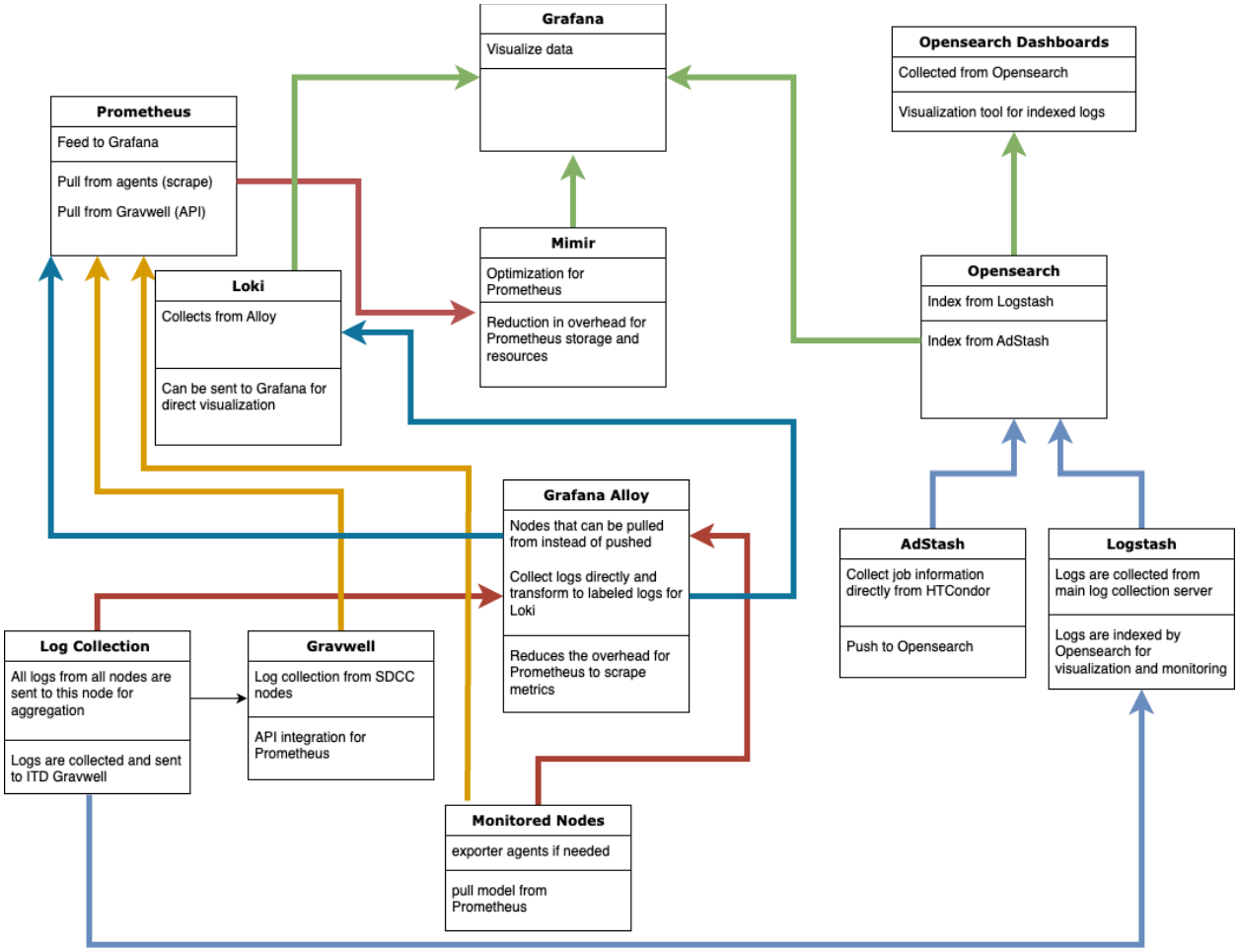
Current production:

- SDCC is currently maintaining and operating a monitoring stack of:
    - Elasticsearch - Data aggregation/indexing/querying
    - Logstash - Log collection/ingestion
    - Kibana - Log analysis/anomaly detection
    - Grafana - Visualization
- The current production setup is monitoring ~1k+ hosts
- An Opensearch cluster with 4 nodes has been added in parallel to this setup for testing purposes

In development:

- SDCC is currently working on optimizing our monitoring setup:
    - Prometheus is being added as an additional service for anomaly detection, possible integration with Gravwell, and to expand integration with various monitoring agents
    - Opensearch is replacing Elasticsearch, Elasticsearch is no longer open-source as of version 7.11.
        - Replacing Elasticsearch with Opensearch will allow SDCC to continue receiving updates as Opensearch is a fork of 7.10 Elasticsearch.
        - Opensearch is compatible with many of the current Elasticsearch API's.
        - Machine learning and anomaly detection (machine learning is a paid feature in Elasticsearch.)
    - Opensearch-Dashboards to replace Kibana for better integration with Opensearch
        - Many Kibana plugins are now unsupported with Opensearch
        - Opensearch-Dashboards includes security, role-based access controls, anomaly detection
        - Future-proofing for Opensearch updates
    - Gravwell integration using Prometheus
        - Prometheus is able to utilize the Gravwell API which is currently collecting logs from many sources
        - Further aggregation with Gravwell can provide more data for better predictive modeling
    - Grafana Alloy:
        - Alloy uses push-based metrics collections instead of pull-based which will reduce the server load for Prometheus
        - Improves scalability for Prometheus
        - Supports Prometheus metrics and Loki logs
    - Loki:

        - Uses the same labels as Prometheus, compatibility between metrics and logs
        - Optimized for storing and querying recent logs efficiently
        - Label only allows for quickly searching logs to troubleshoot
    - Grafana Mimir to support Prometheus:
        - Long term storage allows Mimir to keep metrics for analyzing historical trends
        - Provides sharding and replicating across multiple nodes, assists with scaling as Prometheus is run as a single node
        - Multiple replicas ensure no single point of failure
        - Optimized storage with compression
        - Integration with Grafana
    - AdStash:
        - Performance optimized monitoring of HTCondor nodes
        - Monitor job usage and alerts
        - Integration with Opensearch
    - Logstash will continue to be used for metrics collection, this may be replaced in the future with Gravwell and Prometheus integration
    - Grafana will continue to be used for visualization and Alloy/Mimir usage
    - Monitoring will be scaled to meet production needs:
        - Hardware and storage will be needed to support this as it will eventually become a production system



- Nodes can be pulled directly from Prometheus but to reduce server overhead we can use Alloy to collect and then push to Prometheus.
- Alloy can also collect logs and label for Loki to provide a quicker reference for troubleshooting
- Gravwell integration can create a pathway to bypass the need for a separate Logstash configuration reducing storage costs for logs, Opensearch would still be needed however for AdStash/HTCondor with a smaller storage pool
- Mimir provides a storage optimization for Prometheus and further reduces the needed resources for keeping this data
    - Ability to scale over multiple nodes
    - Ability to allow multiple Prometheus instances to write to it
    - Replicates data to ensure no single point of failure
    - Faster queries than Prometheus alone