

# Aeolus: eBPF based performance optimization framework for Serverless Computing

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Cloud Lab

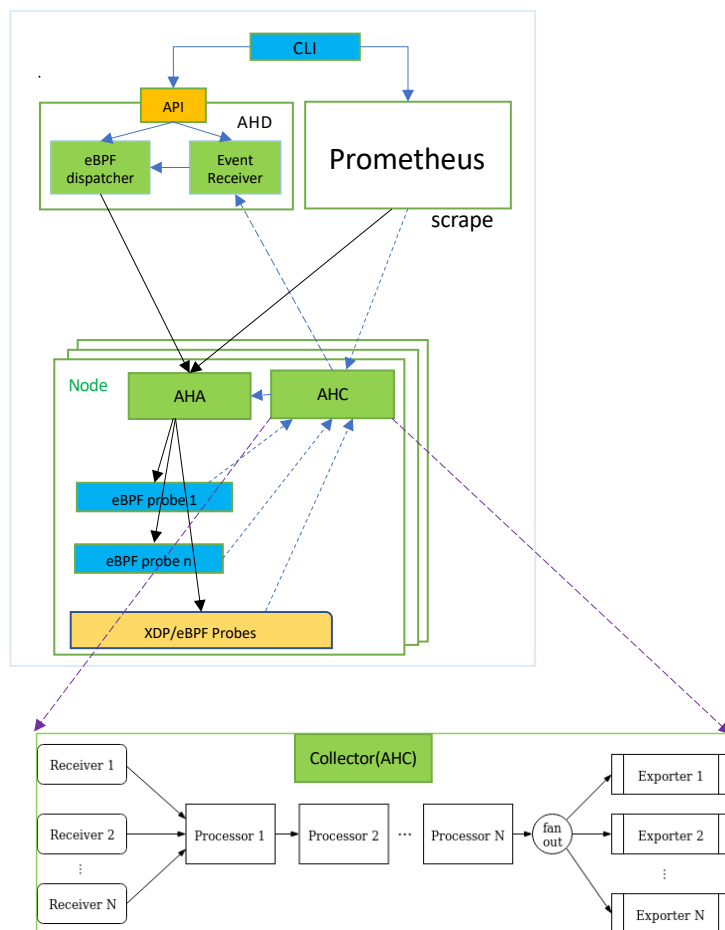
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## Aeolus specific e2e workflow

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**AHD:** Aeolus Health Dictator;

**AHA:** Aeolus Health Agent;

**AHC:** Aeolus Health Collector

Aeolus includes three major components:

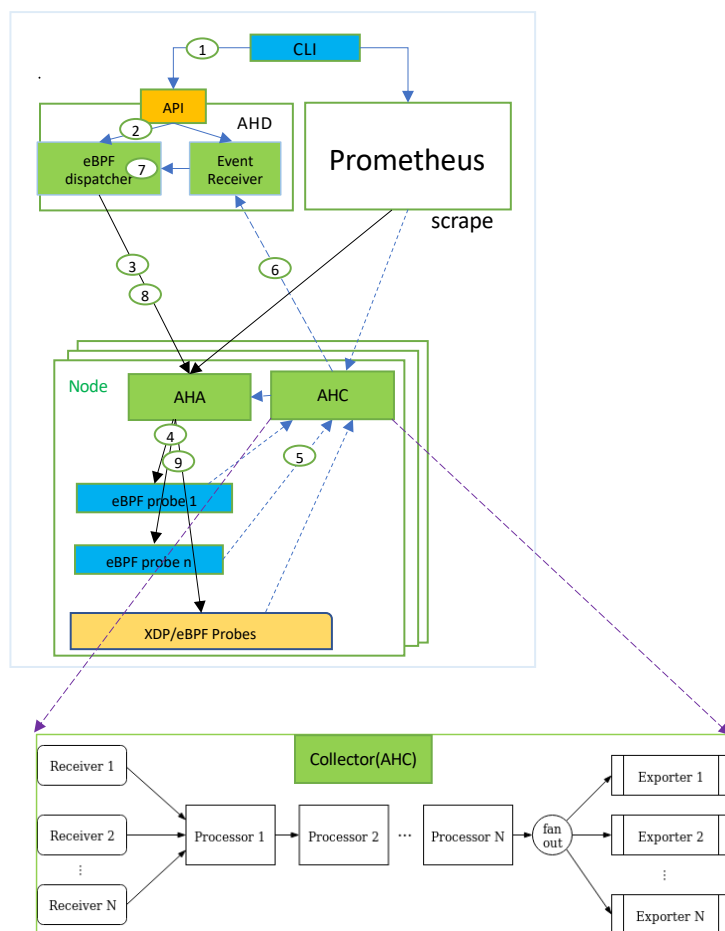
- **AHC** is literally an *open telemetry collector*. The collector can be configured to have one or more pipelines. Each pipeline includes:
  - a set of Receiver that receive the data
  - a series of optional Processor that get the data from receivers and process it
  - a set of Exporter which get the data from processors and send it further outside the Collector.

By default, one exporter(e.g. P Remote Writer Exporter) is needed to push event data to AHD's event receiver; another exporter can be configured for Prometheus;

- **AHA** is deployed on needed node as daemon-set, it receives instruction from AHD and/or optionally from Prometheus and injects eBPF snippet to specific hooks;
- **AHD** is responsible for receiving triggered event data from AHC and provide mechanism to dynamically generate eBPF snippet based on the response and deploy to AHA. It is a critical and intelligent part for push based live anomaly detection and reaction which is not possible in pull-based Prometheus framework.

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### Preparation stage

1. Inject eBPF templates and relationship graph between eBPF templates to **AHD** via **CLI**;
2. **AHD** compiles predefined eBPF codes(templates + parameters) and generate eBPF snippets;
3. **AHD** dispatches eBPF snippets to **AHA**;
4. **AHA** deploys eBPF snippets to specific hooks;

### Collection stage

5. **AHC** collects desired event metrics from eBPF probes;
6. **AHC** pushes event metrics to **Event Receiver** in **AHD**, the metrics includes node and flow specific parameters which are needed for **AHD** to generate follow up eBPF snippets;

### Reaction stage

7. **AHD event receiver** receives event metrics and searches eBPF template relationship graph to find specific eBPF templates and generate eBPF code with parameters included in event metrics; generated eBPF code are verified and compiled to eBPF snippets;
8. **AHD** dispatches eBPF snippets and deploy instructions to **AHA**;
9. **AHA** deploys and/or deletes eBPF snippets from specific hooks;
10. Back to collection stage.

