



Overview

LF Edge eKuiper is a lightweight IoT data analytics and stream processing engine running on resource-constraint edge devices. The major goal for eKuiper is to provide a streaming software framework (similar to [Apache Flink](#)) in edge side. eKuiper's **rule engine** allows user to provide either SQL based or graph based (similar to Node-RED) rules to create IoT edge analytics applications within few minutes.

[blocked URL](#)

User scenarios

It can be run at various IoT edge user scenarios, such as,

- Real-time processing of production line data in the IIoT
- Gateway of connected vehicle analyze the data from CAN in IoV
- Real-time analysis of wind turbines and smart bulk energy storage data in smart energy

eKuiper processing at the edge can greatly reduce system response latency, save network bandwidth and storage costs and improve system security.

Features

- Lightweight
 - Core server package is only about 4.5M, memory footprint is about 10MB
- Cross-platform
 - CPU ArchX86 AMD * 32/64; ARM * 32/64; PPC
 - Popular Linux distributions, OpenWrt Linux, MacOS and Docker
 - Industrial PC, Raspberry Pi, industrial gateway, home gateway, MEC edge cloud server
- Data analysis support
 - Support data ETL
 - Data order, group, aggregation and join with different data sources (the data from databases and files)

- 60+ functions, includes mathematical, string, aggregate and hash etc
 - 4 time windows & count window
- Highly extensible

It supports to extend at Source, Functions and Sink with Golang or Python.

- Source: allows users to add more data source for analytics.
 - Sink: allows users to send analysis result to different customized systems.
 - UDF functions: allow users to add customized functions for data analysis (for example, AI/ML function invocation)
- Management
 - [A free web based management dashboard](#) for visualized management
 - Plugins, streams and rules management through CLI, REST API and config maps(Kubernetes)
 - Easily be integrated with Kubernetes frameworks [KubeEdge](#), [OpenYurt](#), [K3s Baetyl](#)
- Integration with EMQX products

Seamless integration with [EMQX](#), [Neuron](#) & [NanoMQ](#), and provided an end-to-end solution from IIoT, IoV

Quick Start

- [eKuiper 5 minutes quick start](#)
- [EdgeX rule engine tutorial](#)

Performance Test Result

MQTT throughput test

- Using JMeter MQTT plugin to send simulation data to EMQ X Broker, such as: {"temperature": 10, "humidity" : 90}, the value of temperature and humidity are random integer between 0 - 100.
- eKuiper subscribe from EMQ X Broker, and analyze data with SQL: SELECT * FROM demo WHERE temperature > 50
- The analysis result are wrote to local file by using [file sink plugin](#).

Devices	Message # per second	CPU usage	Memory usage
Raspberry Pi 3B+	12k	sys+user: 70%	20M
AWS t2.micro(1 Core * 1 GB) Ubuntu18.04	10k	sys+user: 25%	20M

EdgeX throughput test

- A [Go application](#) is wrote to send data to ZeroMQ message bus, the data is as following.

```
{
  "Device": "demo", "Created": 000, ...
  "readings":
  [
    {"Name": "Temperature", value: "30", "Created":123 ...},
    {"Name": "Humidity", value: "20", "Created":456 ...}
  ]
}
```

- eKuiper subscribe from EdgeX ZeroMQ message bus, and analyze data with SQL: SELECT * FROM demo WHERE temperature > 50. 90% of data will be filtered by the rule.
- The analysis result are sent to [nop sink](#), all of the result data will be ignored.

	Message # per second	CPU usage	Memory usage
AWS t2.micro(1 Core * 1 GB) Ubuntu18.04	11.4 k	sys+user: 75%	32M

Max number of rules support

- 8000 rules with 800 message/second
- Configurations
 - 2 core * 4GB memory in AWS
 - Ubuntu
- Resource usage
 - Memory: 89% ~ 72%
 - CPU: 25%
 - 400KB - 500KB / rule
- Rule

- Source: MQTT
- SQL: SELECT temperature FROM source WHERE temperature > 20 (90% data are filtered)
- Sink: Log



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TSC 2023-09-12 created Sep 11, 2023

Links

- [eKuiper on GitHub](#)
- [eKuiper Documentation](#)
- eKuiper Slack: Join [lf-edge](#), and then join [ekuiper](#) or [ekuiper-user](#) channel.
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