GEdge Platform

GEdge(Griffin-Edge) Platform
- 초저지연 지능형 클라우드 엣지 SW 플랫폼 -

최적 자원 배치를 위한 글로벌 스케줄링 기술

2021.12.09

GS-Engine 프레임워크 코어 개발자 (GS-Scheduler)

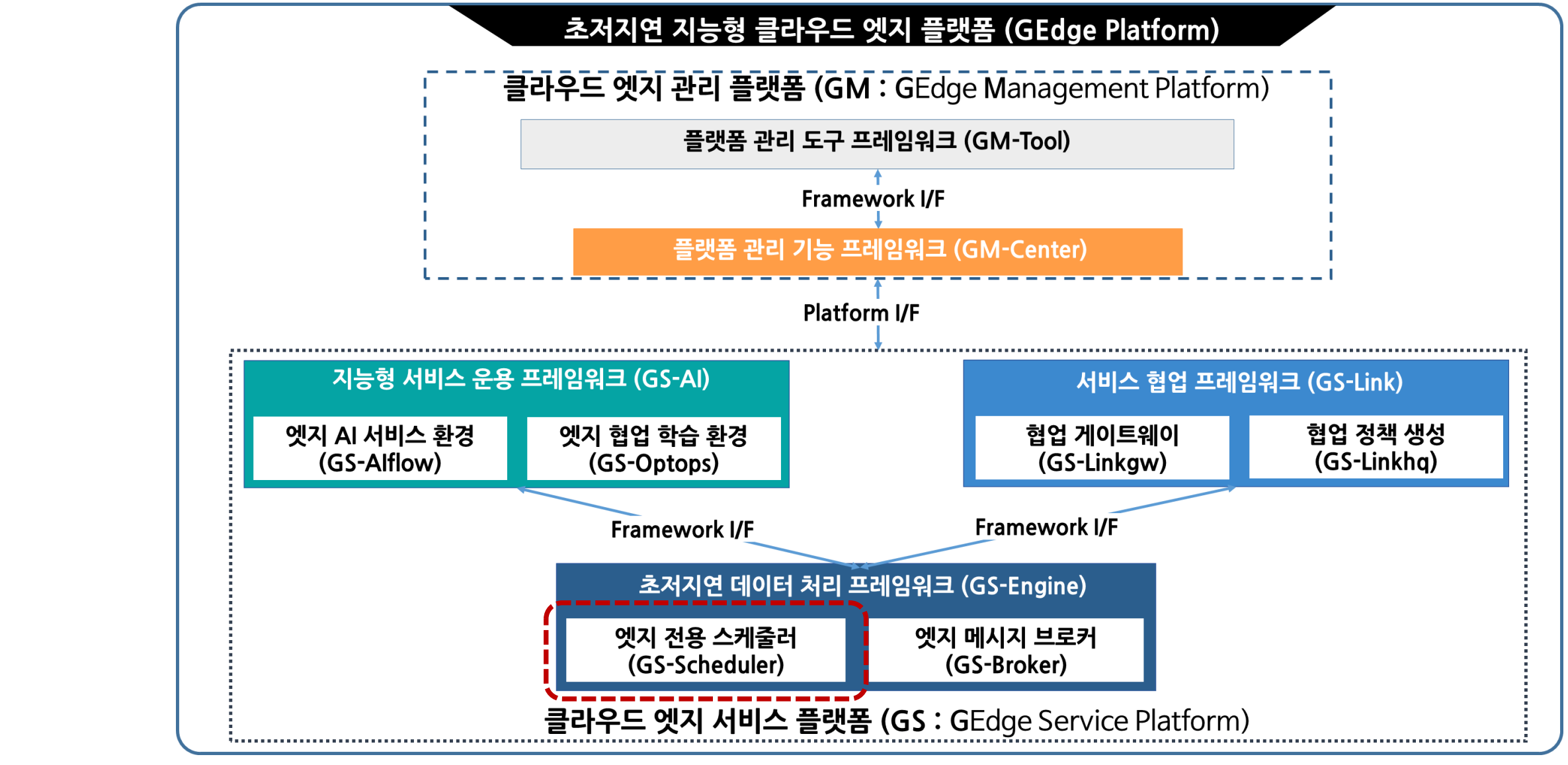
발표자 장수민(jsm@etri.re.kr)

"GEdge Platform" 은 클라우드 중심의 엣지 컴퓨팅 플랫폼을 제공하기 위한
핵심 SW 기술 개발 커뮤니티 및 개발 결과물의 코드명입니다.

- Developer-Friendly

GEdge Platform Community 3rd Conference (GEdge Platform v2.0 Release) -

이번 발표의 기술적 포지셔닝



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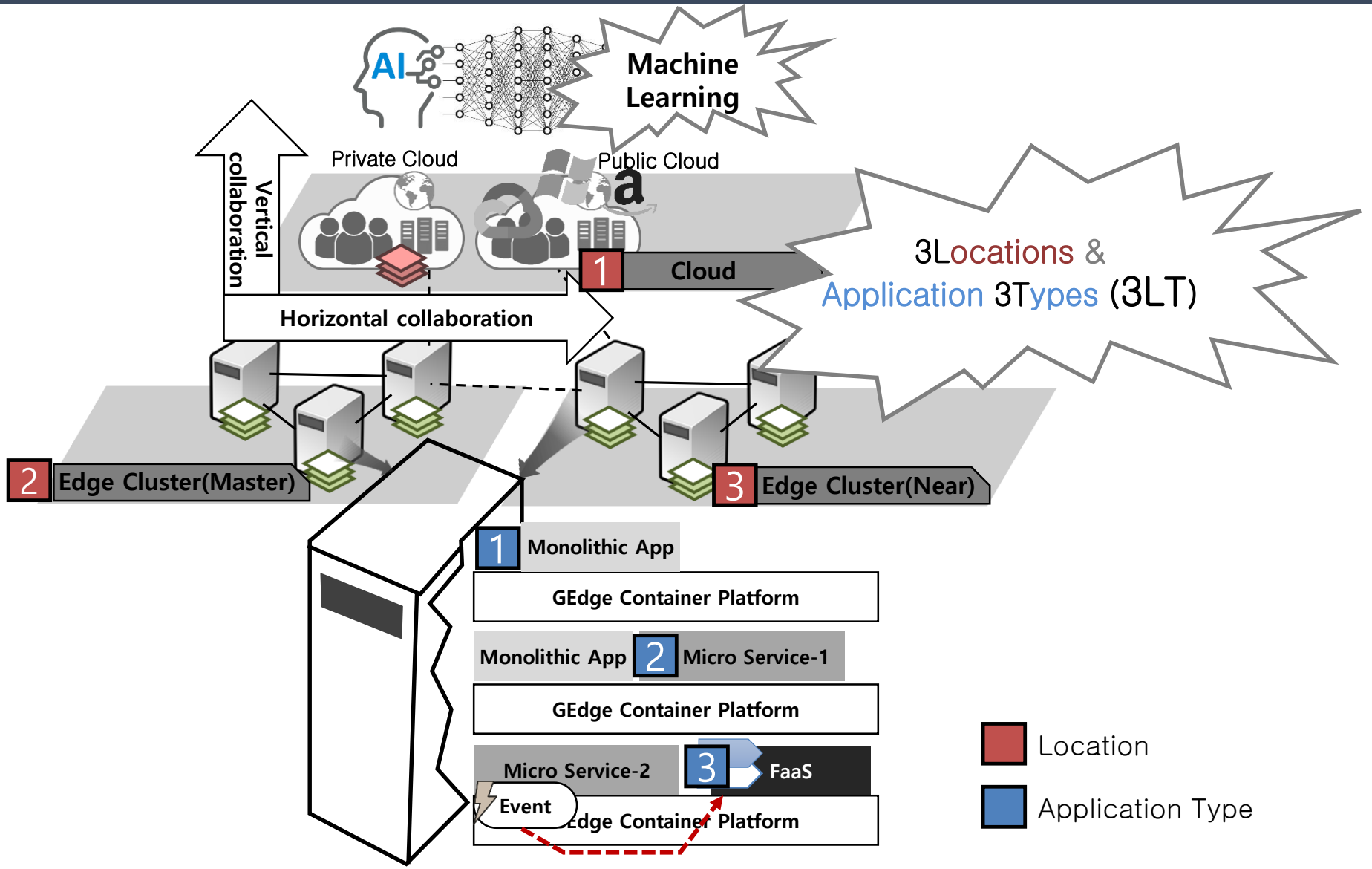
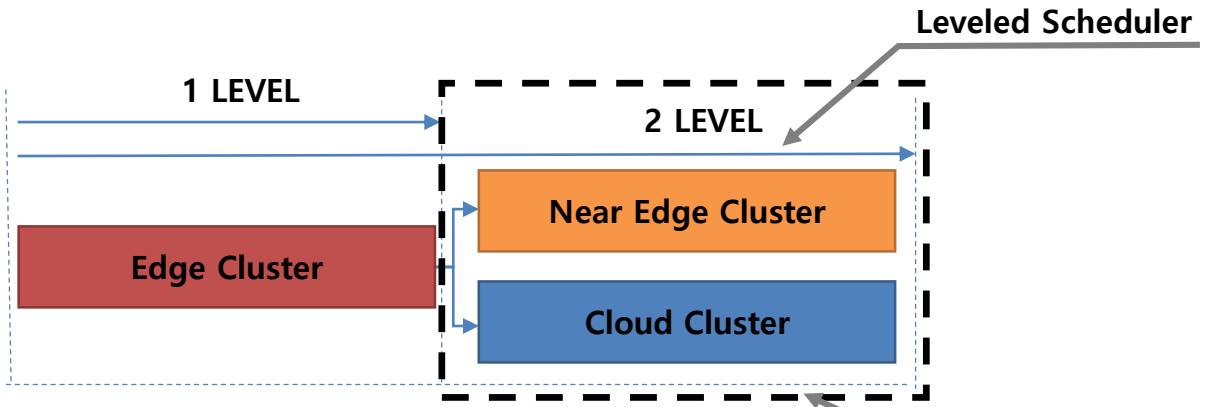
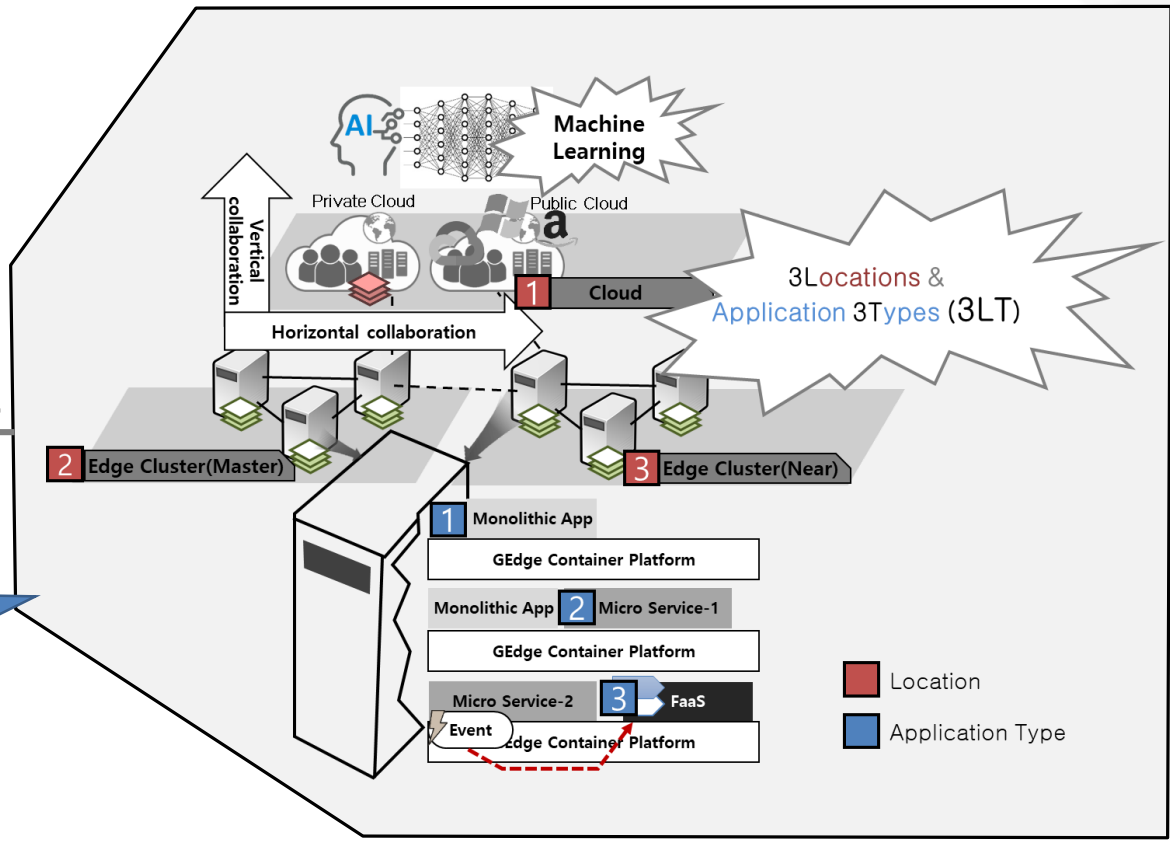
글로벌 스케줄러 개요

1 GEdge-Platform System : 3LT

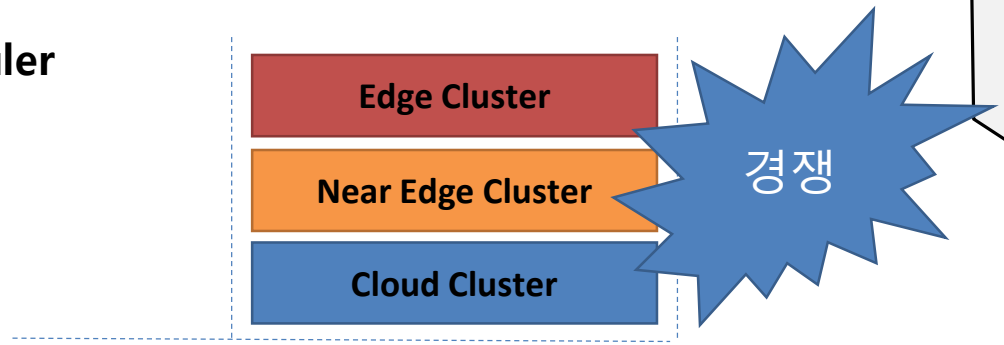


2 GEdge-Platform System : Structure of GS-Scheduler

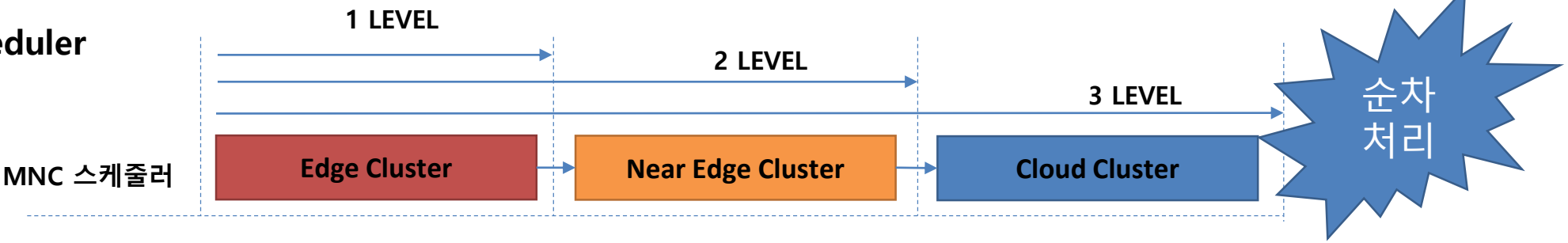




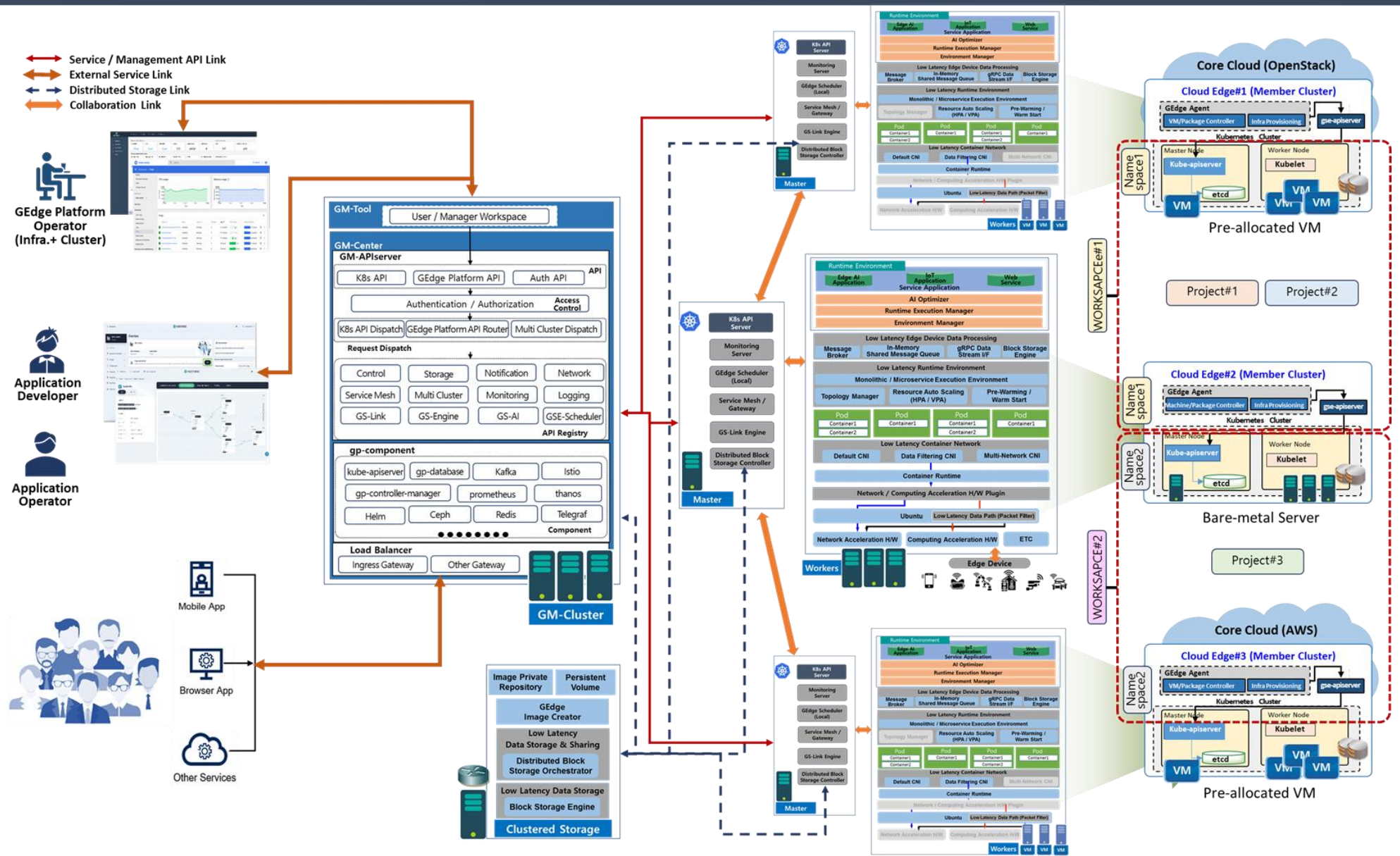
Shared Scheduler



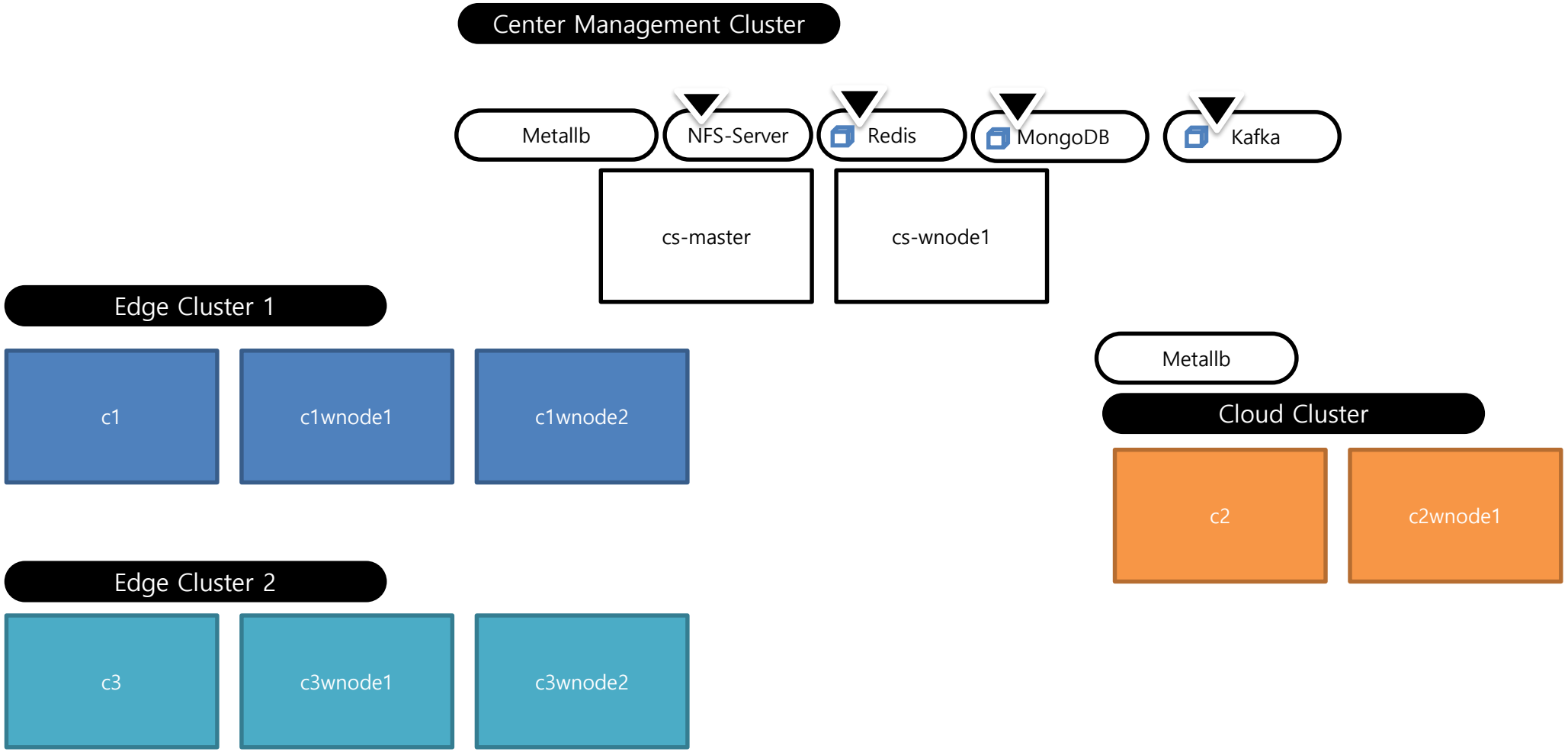
Leveled Scheduler



3 GEdge-Platform System Structure

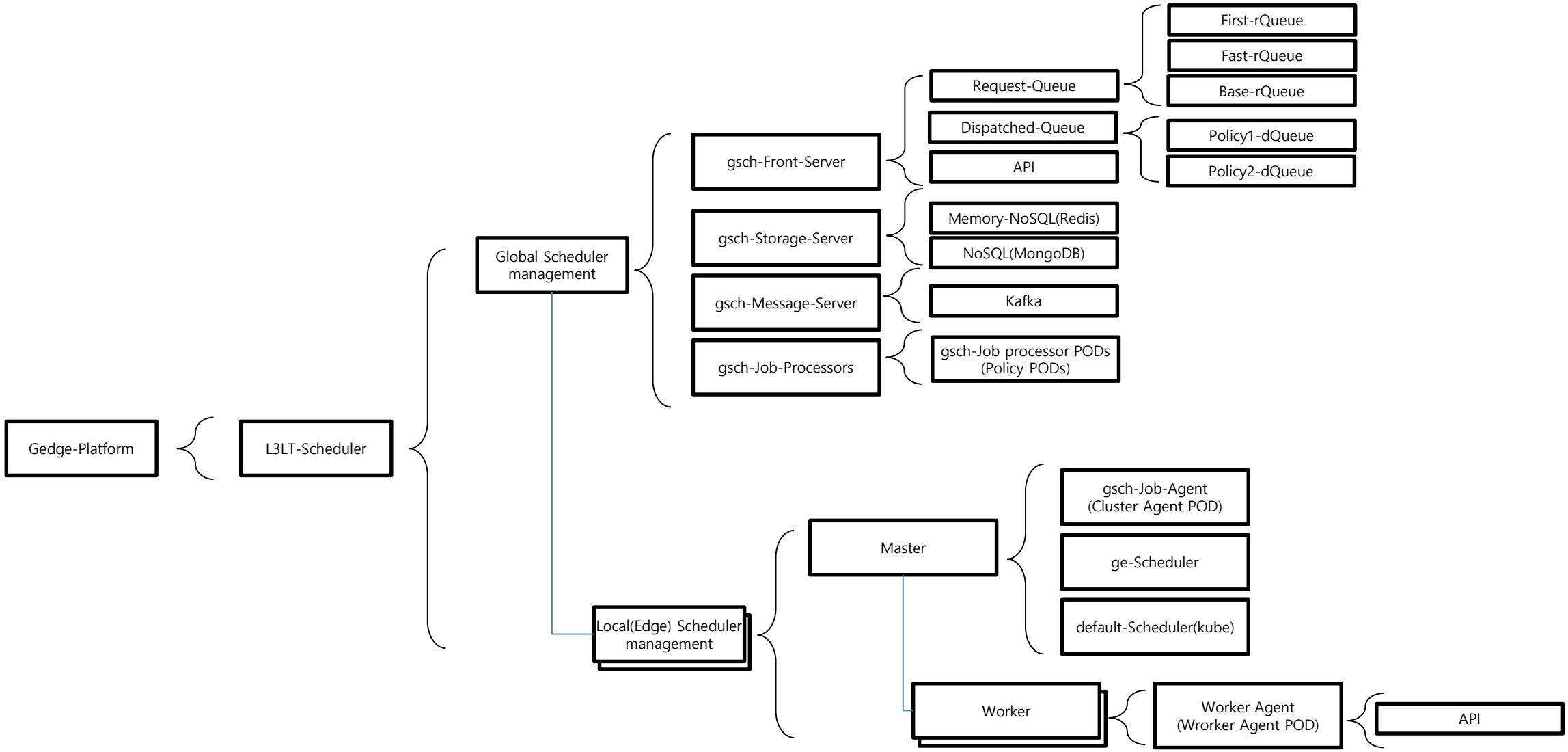


4 GS-Scheduler : Developing System Structure



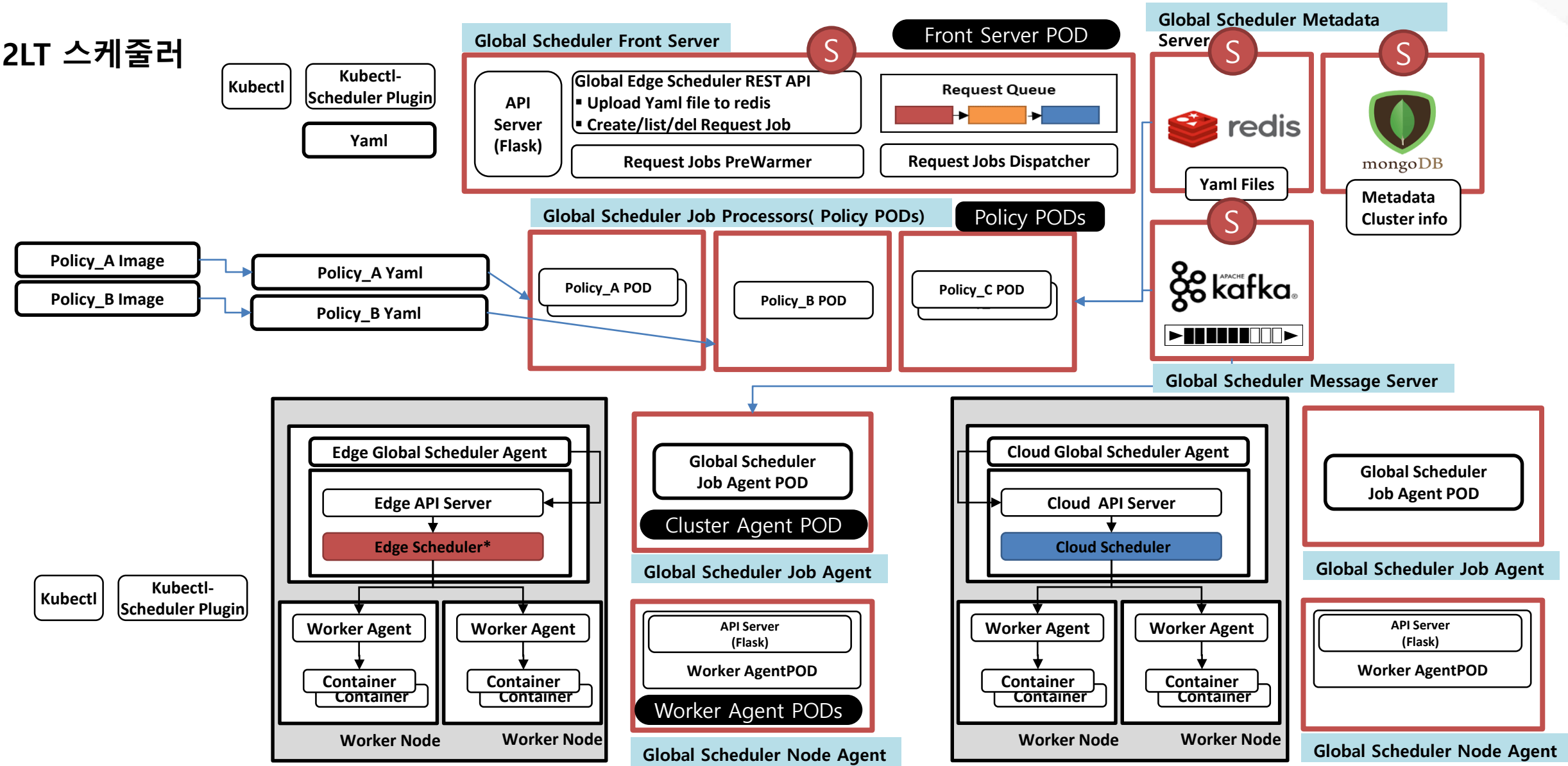
글로벌 스케줄러 핵심 기능

1 GS-Scheduler : Core Modules

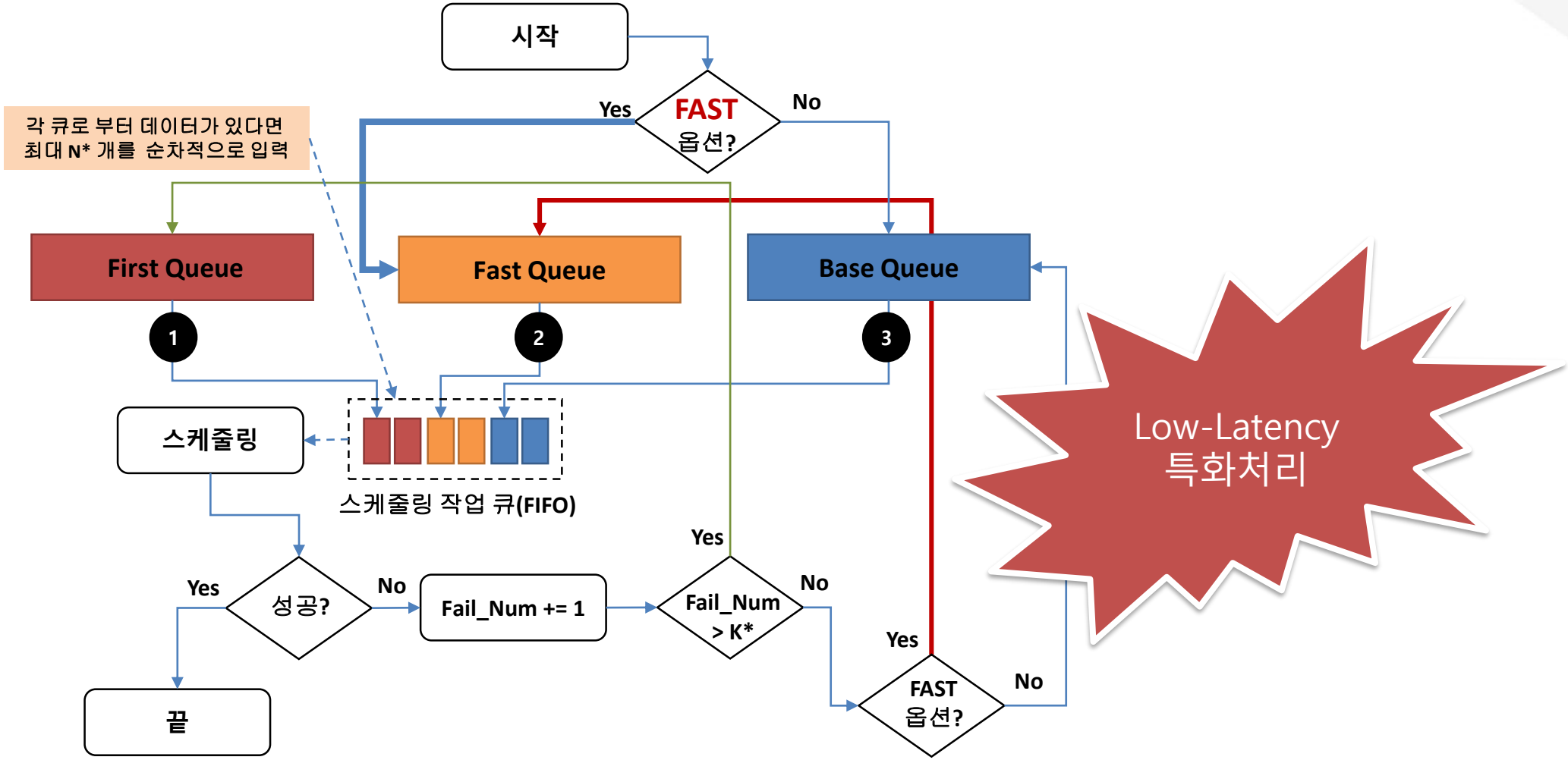


2 GS-Scheduler : System Structure

2LT 스케줄러

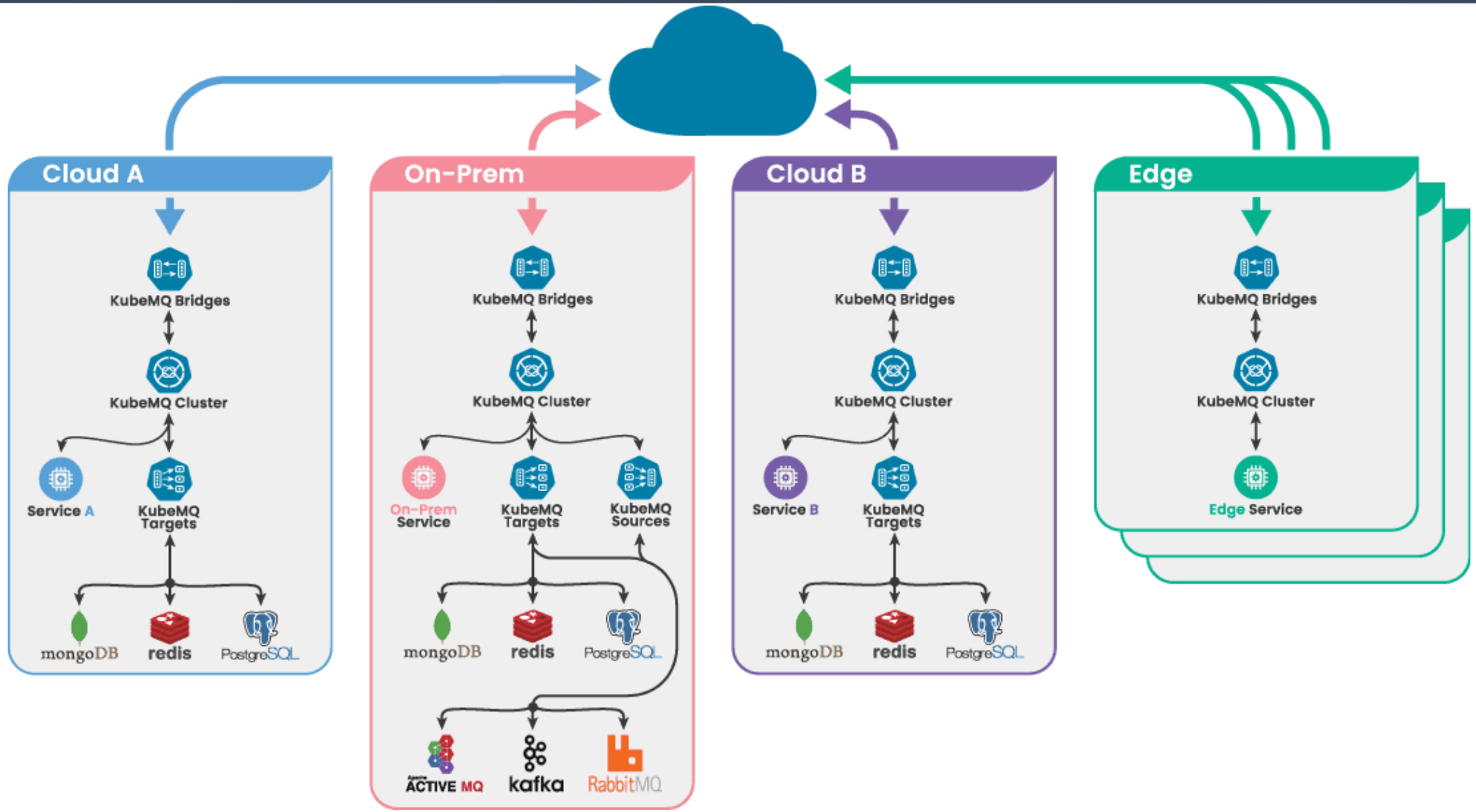


3 GS-Scheduler : Scheduler Queue



N*, K* Values are defined by System

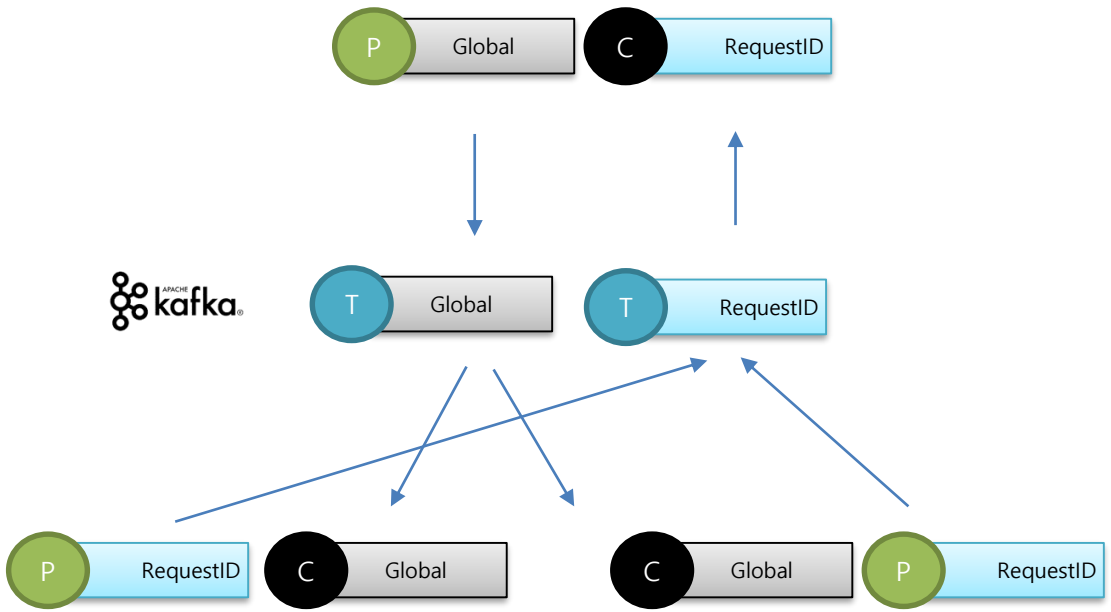
4 GS-Scheduler : Kubemq



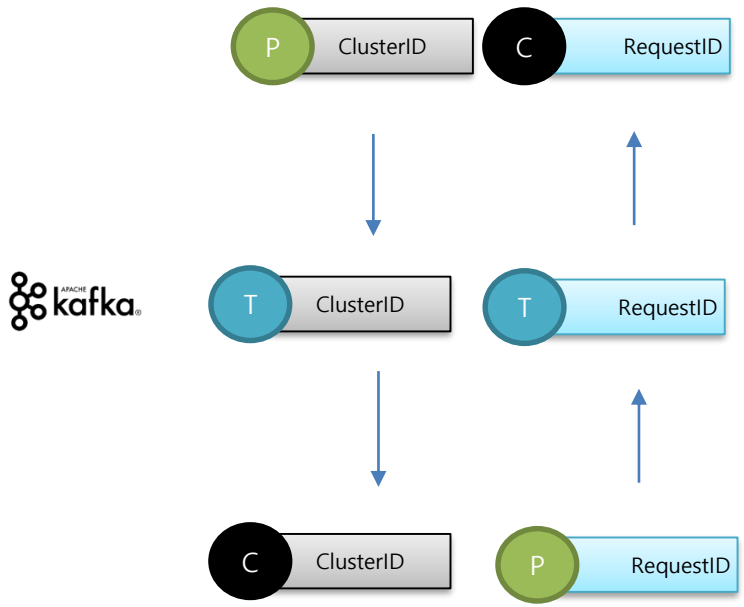
4 GS-Scheduler : Message Server

GEdge Platform

1:N



1:1



4 GS-Scheduler : Message Server

Source	Type	cluster/node/pod
	Object	"c1" {"cluster":"c1","node":"n1"} {"cluster":"c1","pod":"p1"}
Target	Type	cluster(s)/node(s)/pod(s)
	Object	c1/[c1,c2] [{"cluster":"c1","node(s)":n1/["n1"]}] [{"cluster":"c1","pod(s)":p1/["p1"]}]
HCode		0x0001
LCode		0x0001
Msg		env: - name : gschConfig value : '{ "type" : "global", "targetClusters": "[cluster1,[cluster2,cluster3]]", "priority" : "GLowLatencyPriority" .... }

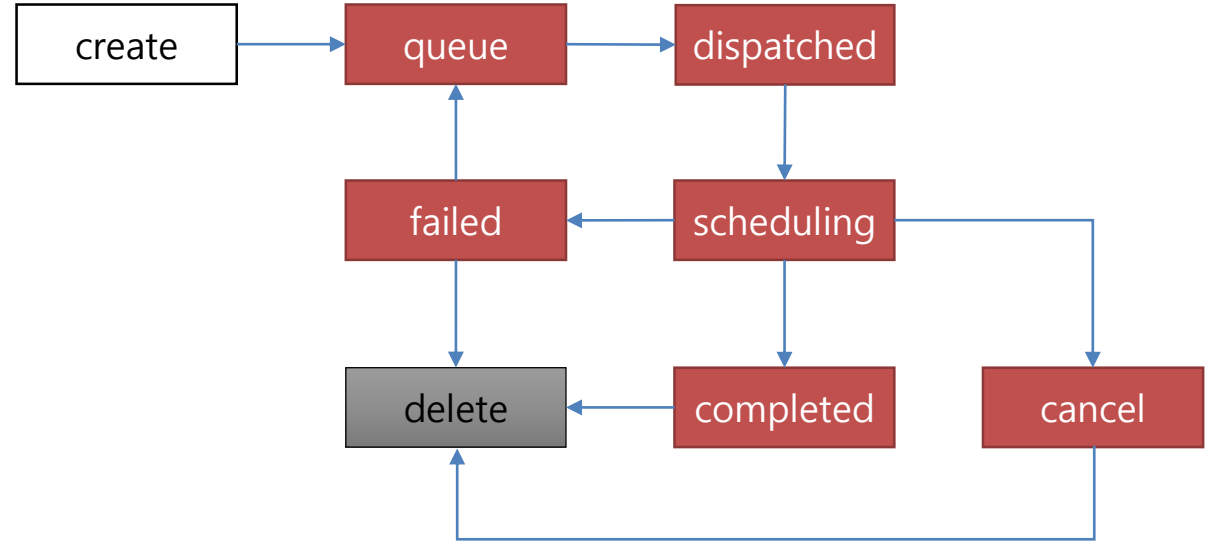
5 GS-Scheduler : Request Job Lifecycle

GEdge Platform

lifecycle

Request Job

- RequestID
- Date
- FileID
- Status
- FailCnt
- Env

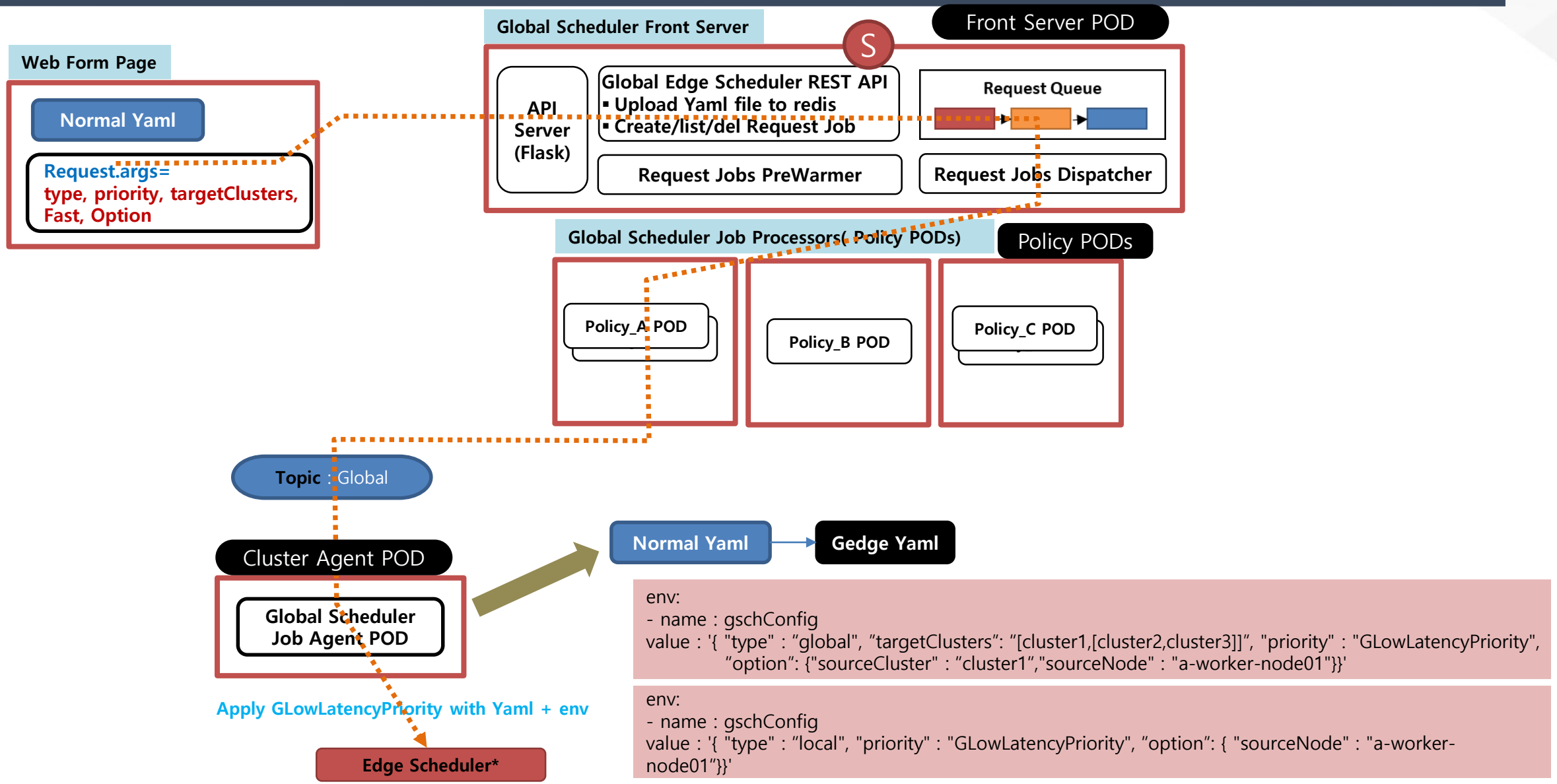


gschConfig Data

```
env:
- name : gschConfig
value : '{ "type" : "global", "targetClusters": "[cluster1,[cluster2,cluster3]]", "priority" : "GLowLatencyPriority",
          "option": {"sourceCluster" : "cluster1","sourceNode" : "a-worker-node01"}}'
```

```
env:
- name : gschConfig
value : '{ "type" : "local", "priority" : "GLowLatencyPriority", "option": { "sourceNode" : "a-worker-node01"}}'
```

6 GS-Scheduler : Main Processing Procedures

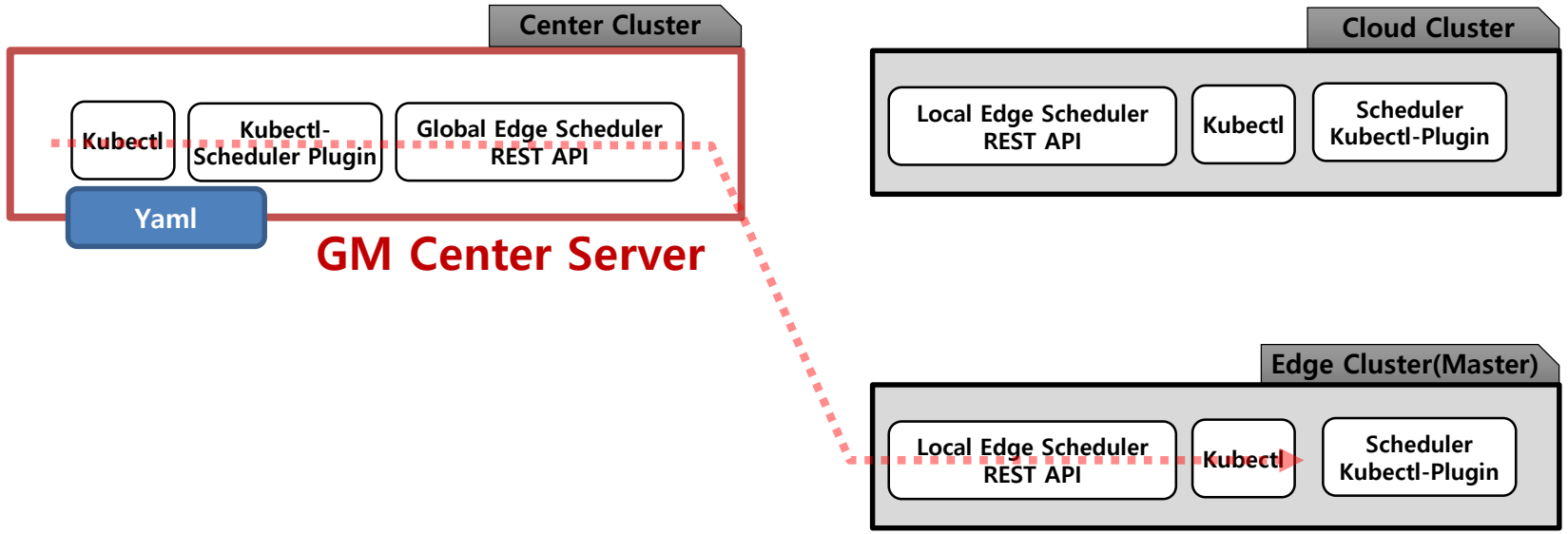


6 GS-Scheduler : Main Processing Procedures

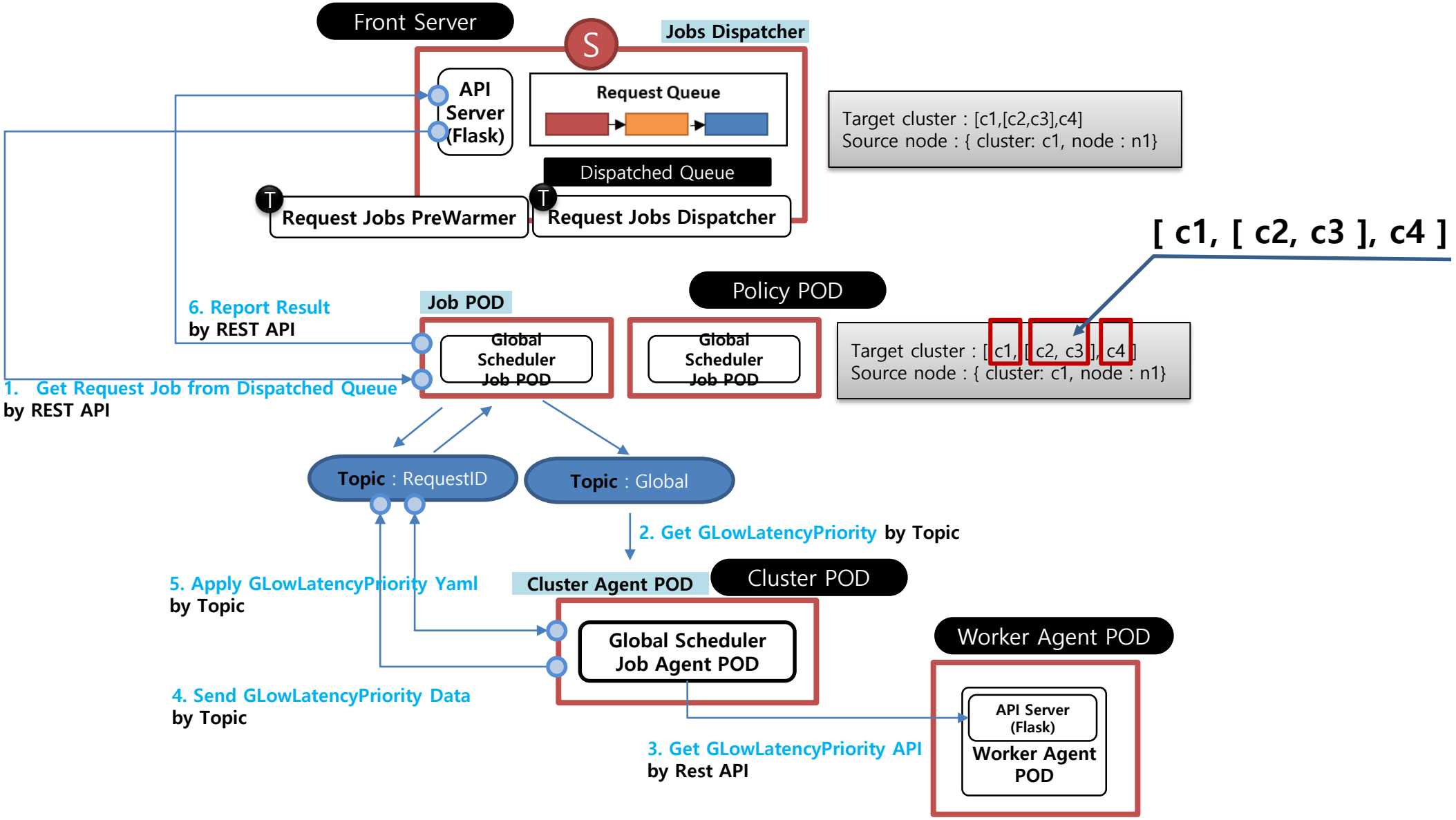
GEdge Platform

Yaml

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  namespace: gedge-system
  name: test-sch-deploy
spec:
  selector:
    matchLabels:
      app: test-sch-pod
  replicas: 8
  template:
    metadata:
      labels:
        app: test-sch-pod
    spec:
      schedulerName: griffin_scheduler
      containers:
      - name: test-sch-container
        env:
          - name : gschConfig
            value : '{ "type" : "local", "priority" : "low-latency",
                       "sourceNode" : "a-worker-node01" }'
```



6 GS-Scheduler : Main Processing Procedures



GS-Scheduler : Supported Policy

GLowLatencyPriority

```
env:
- name : gschConfig
value : '{ "type" : "global", "targetClusters": "[cluster1,[cluster2,cluster3]]", "priority" : "GLowLatencyPriority",
           "option": {"sourceCluster" : "cluster1","sourceNode" : "a-worker-node01"}}'
```

```
env:
- name : gschConfig
value : '{ "type" : "local", "priority" : "GLowLatencyPriority", "option": { "sourceNode" : "a-worker-node01"}}'
```

GMostRequestedPriority

```
env:
- name : gschConfig
value : '{ "type" : "global", "targetClusters": "[cluster1,[cluster2,cluster3]]", "priority" : "GMostRequestedPriority"}
```

```
env:
- name : gschConfig
value : '{ "type" : "local", "priority" : " GMostRequestedPriority }'
```

GSelectedCluster

```
env:
- name : gschConfig
value : '{ "type" : "global", "targetClusters": "[c1,c2,c3]", "priority" : "GSelectedCluster"}'
```

GS-Scheduler : Pre-Warmer

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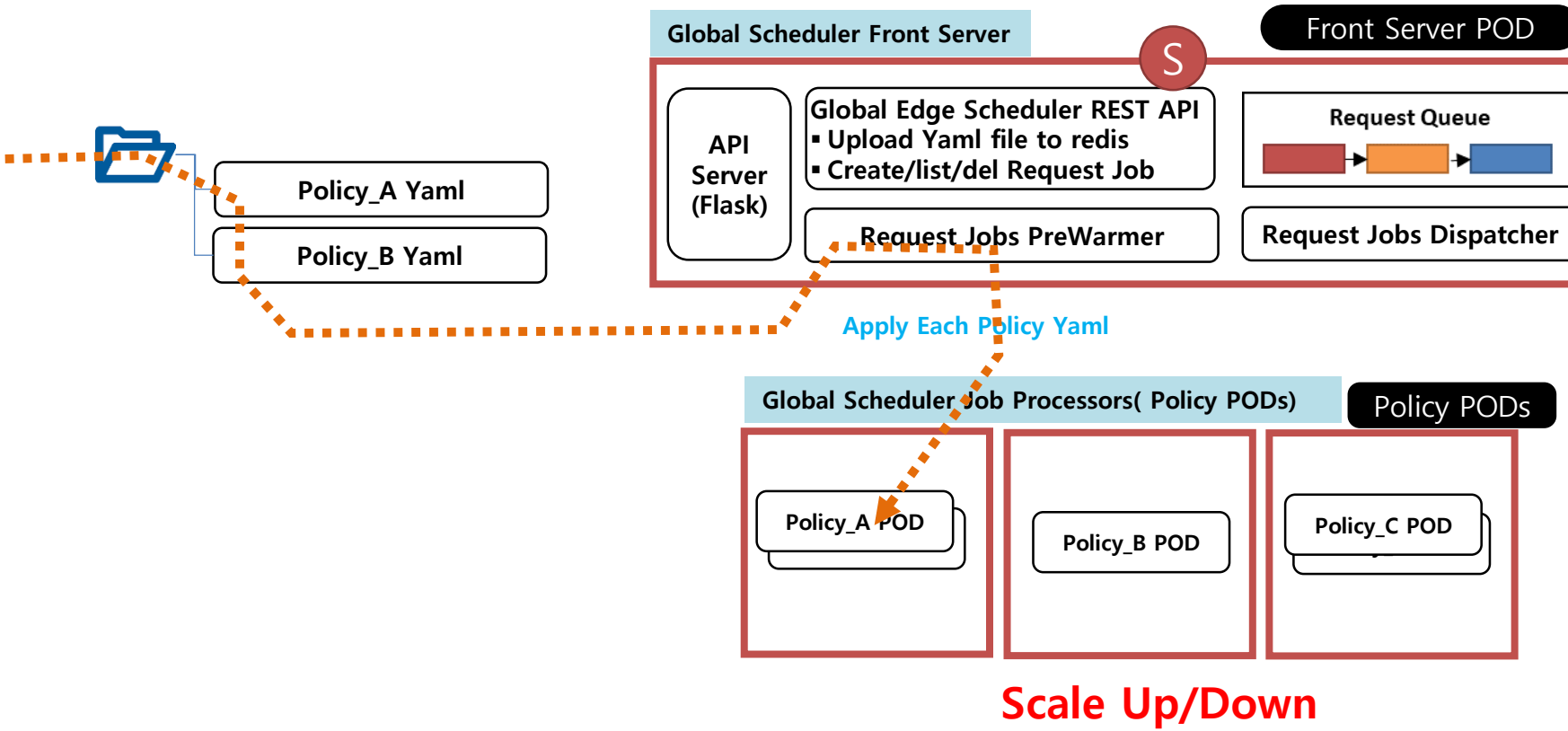
Pre-Warmer

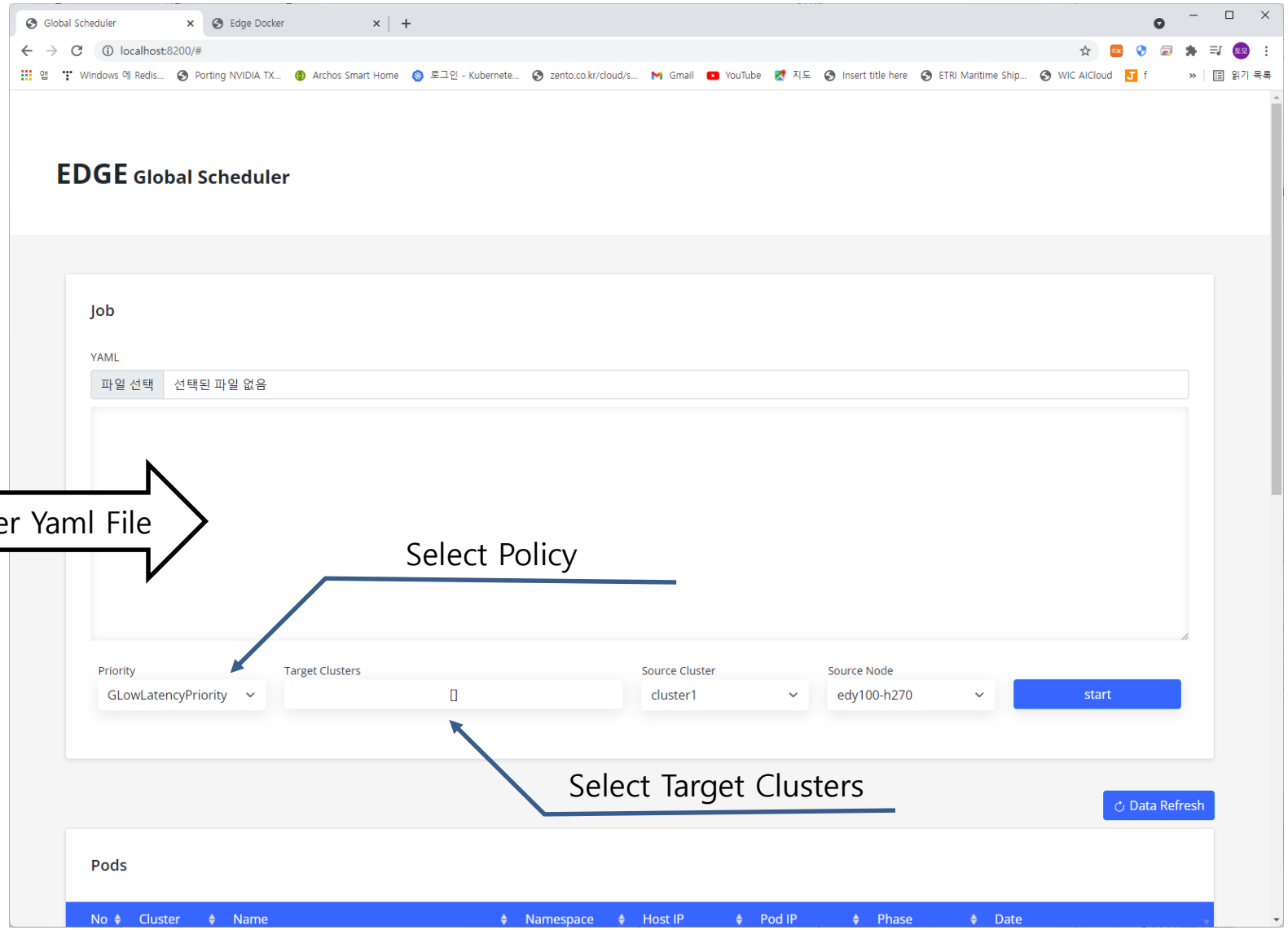
✓ Front Server POD을 통하여 초기화 특정 디렉토리 Deployment Yamls 로 모든 Policy PODs 실행
✓ Request Queue와 Dispatched Queue 모니터링 정보를 통하여 특정 Policy의 Deployment Yamls Replicas의 제어를 통하여 Scale Up/Down

Policy-POD

- Front server API를 통하여 dispatched queue로부터 해당 policy 관련 request Job 을 자동으로 가져가 처리



9 GS-Scheduler : User Interface



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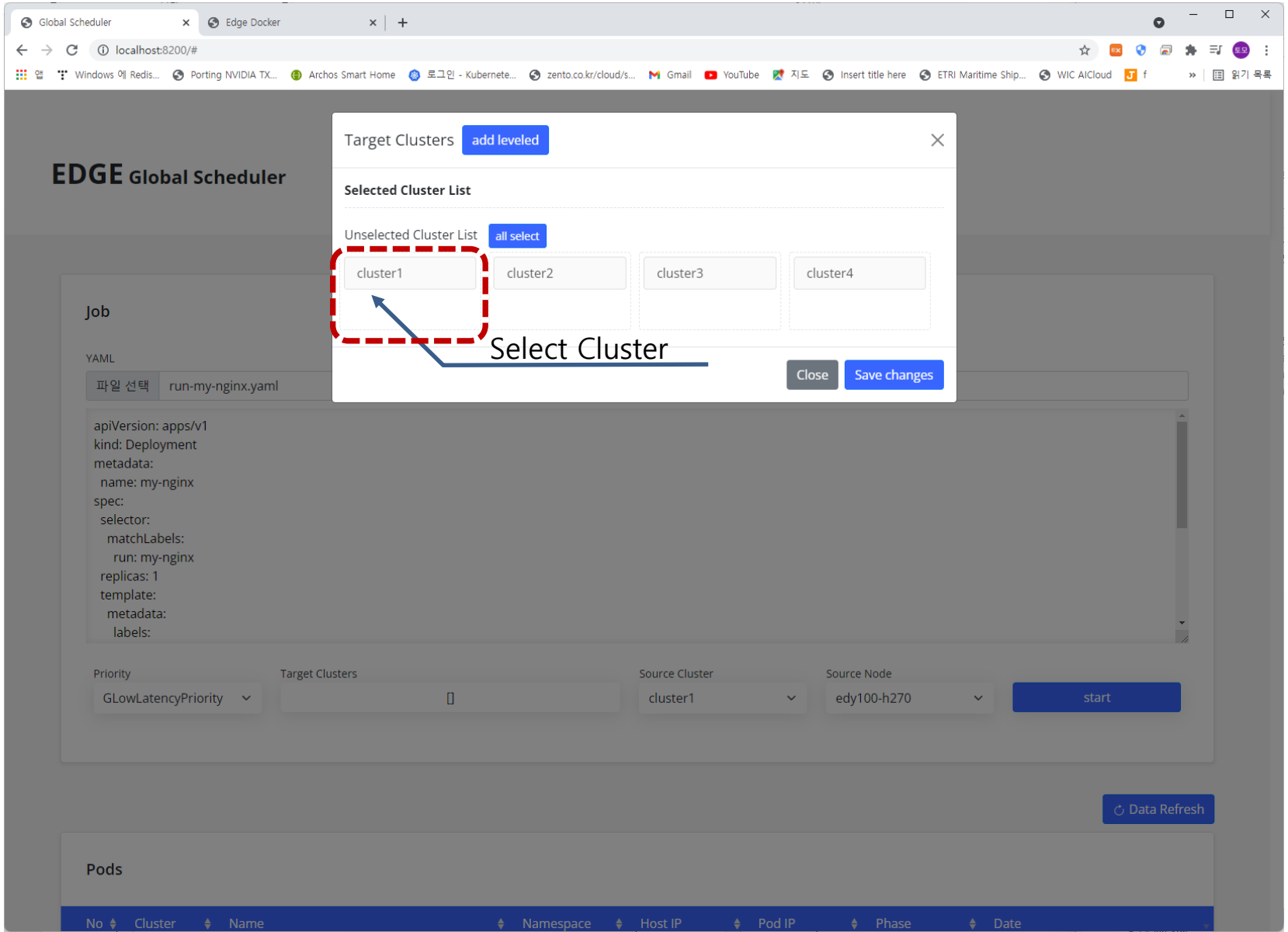

9 GS-Scheduler : User Interface

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Created Pods

Pods

No	Cluster	Name	Namespace	Host IP	Pod IP	Phase	Date
1	cluser1	custom-scheduler-worker-agent-daemonset-tcwbk	gedge-system	172.16.11.135	10.32.0.10	Running	2021-11-24 15:49:22
2	cluser1	glowlatency-7c8fc6ddb5-hlvrs	default	172.16.11.135	10.32.0.12	Running	2021-11-24 15:41:46
3	cluser1	glowlatency-7c8fc6ddb5-jt8sb	default	172.16.11.135	10.32.0.9	Running	2021-11-24 15:41:46
4	cluser1	glowlatency-7c8fc6ddb5-tw74j	default	172.16.11.135	10.32.0.17	Running	2021-11-24 15:41:46
5	cluser1	gmostrequested-75cd57b754-2bhvn	default	172.16.11.135	10.32.0.16	Running	2021-11-22 16:06:26
6	cluser1	gmostrequested-75cd57b754-4hzn5	default	172.16.11.135	10.32.0.5	Running	2021-11-22 16:06:26
7	cluser1	gmostrequested-75cd57b754-bwxhr	default	172.16.11.135	10.32.0.2	Running	2021-11-22 16:06:26
8	cluser1	gselectedcluster-686456b4c4-4bhvz	default	172.16.11.135	10.32.0.19	Running	2021-11-22 16:06:26
9	cluser1	gselectedcluster-686456b4c4-d97hv	default	172.16.11.135	10.32.0.11	Running	2021-11-22 16:06:26
10	cluser1	gselectedcluster-686456b4c4-t644d	default	172.16.11.135	10.32.0.18	Running	2021-11-22 16:06:26

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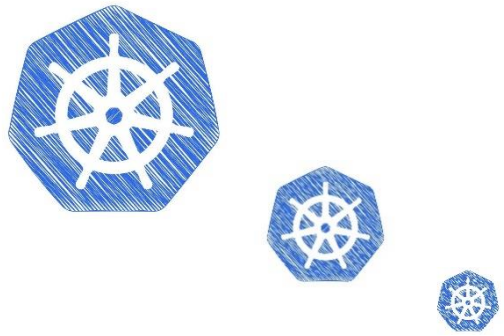
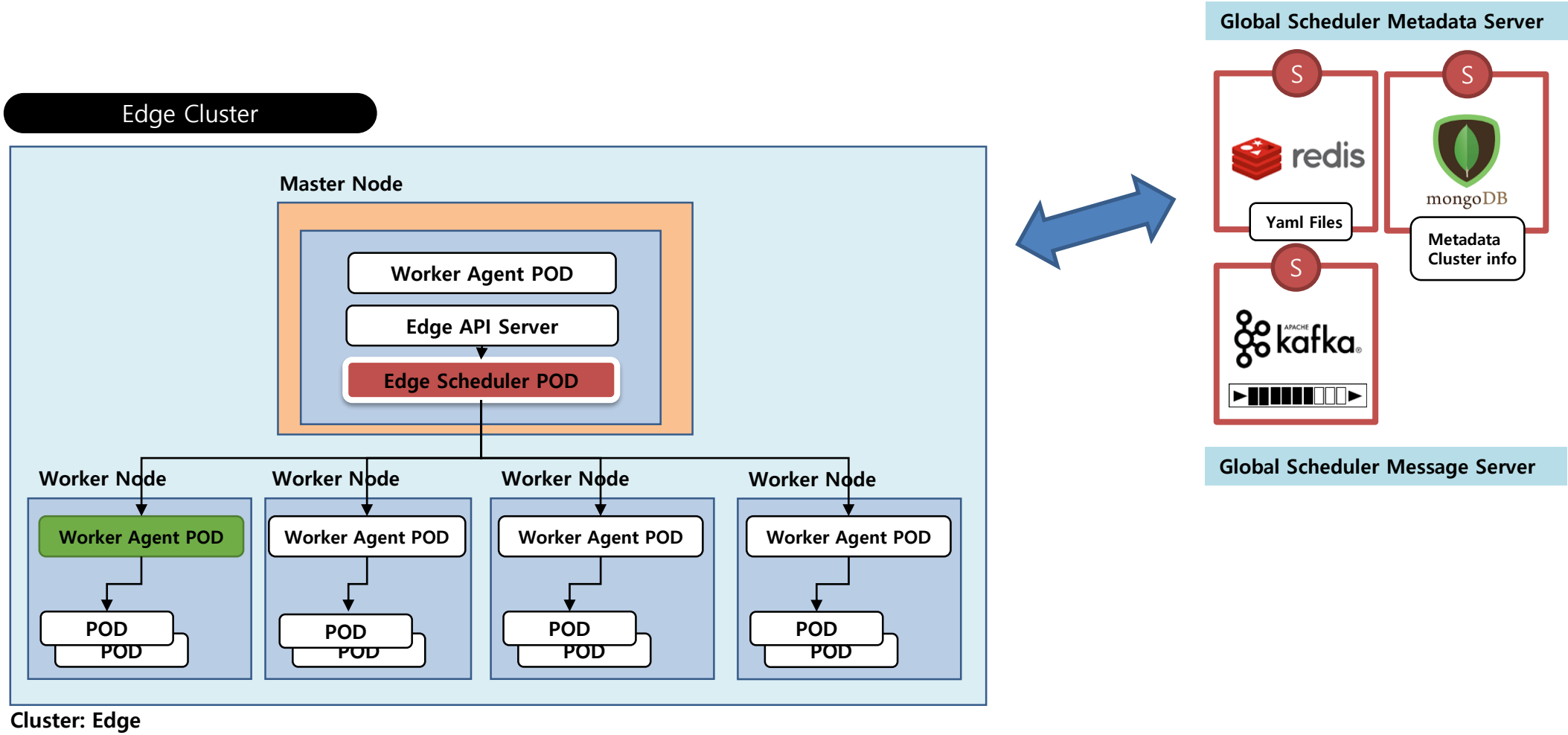
로컬 스케줄러 핵심 고도화

1 GS-Scheduler : Local Scheduler

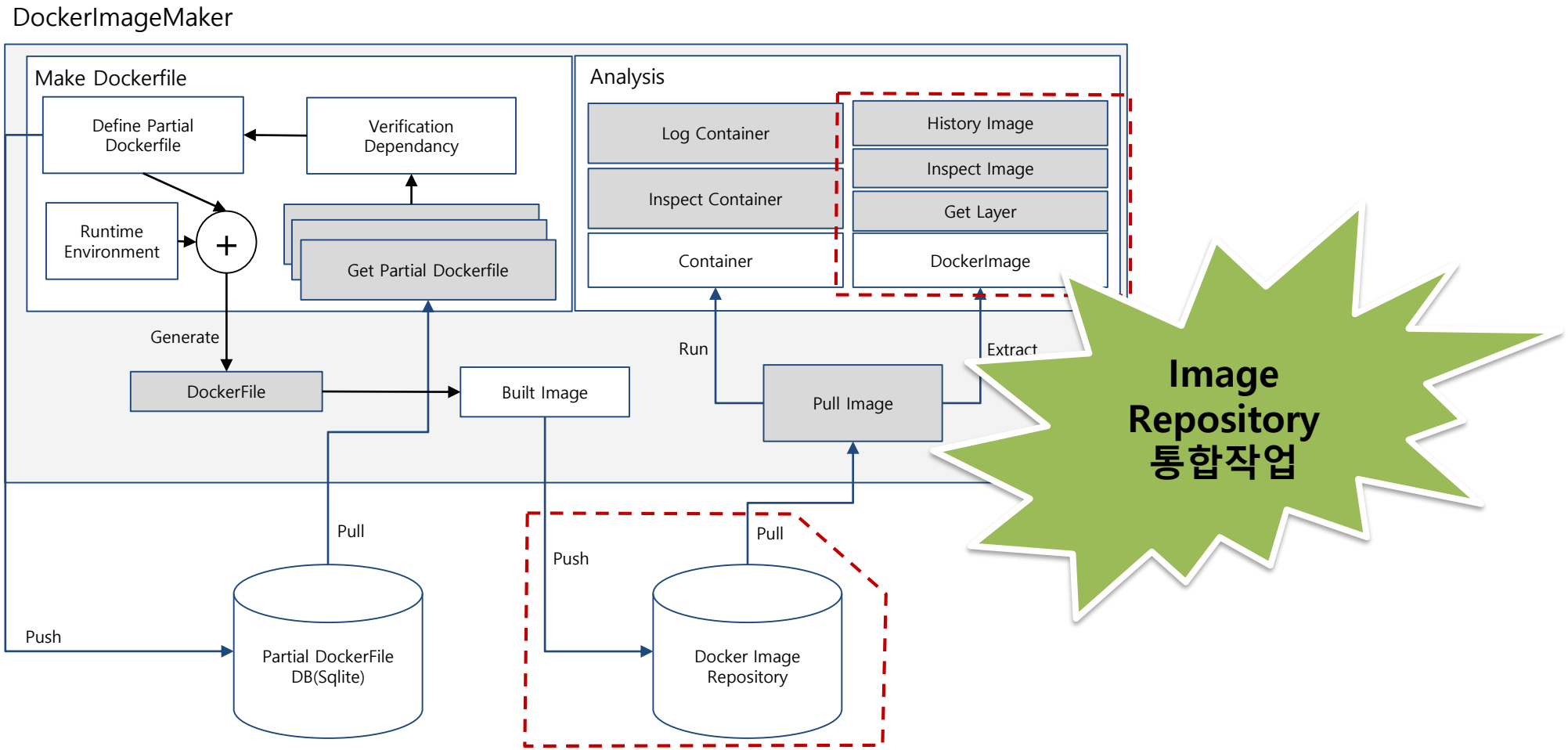
- 스케줄러 적용 Namespace 확대
  - Default -> Any Namespace
- 로컬 스케줄러 관련 모듈의 도커 이미지화
- 스케줄러 관련 모듈 모두 POD화
  - ✓ Cluster RoleBing을 통한 권한 처리
  - ✓ 실시간 모니터링을 위한 워커 에이전트 POD로 작동
  - ✓ 전용 스케줄러 POD로 작동
- 추가 로컬 스케줄러 정책 적용
  - ✓ LowLatencyPriority
  - ✓ MostRequestedPriority



2 GS-Scheduler : System Structure of Local Scheduler



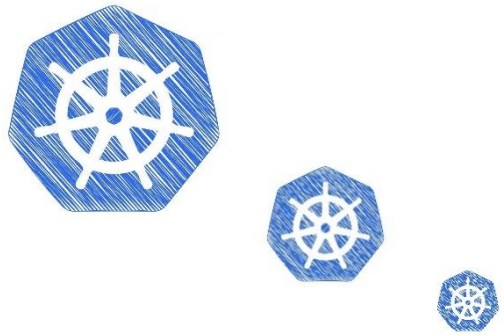
3 GS-Scheduler : Docker Image Maker



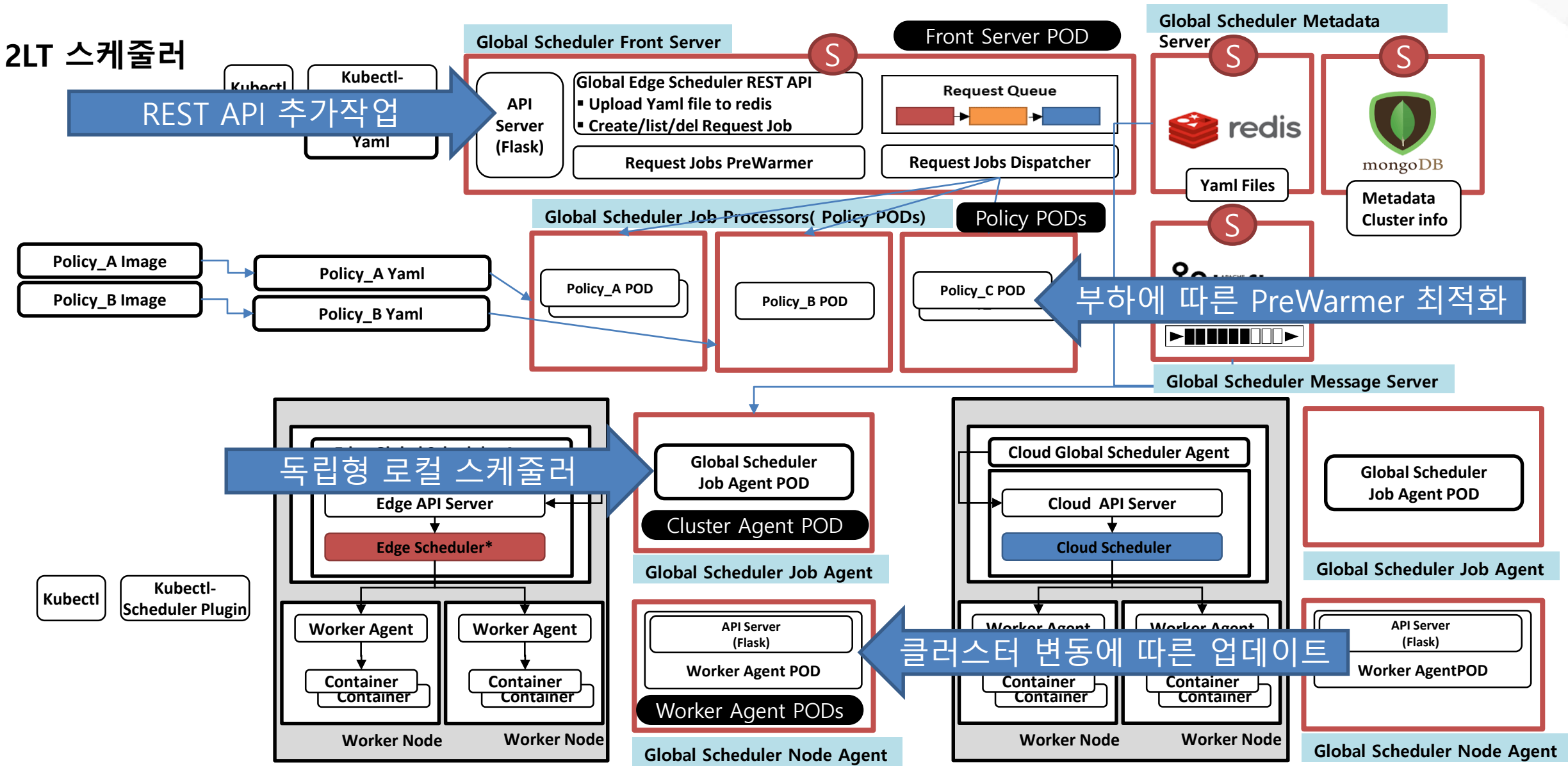
IV 향후 개발 계획

1 GS-Scheduler : Local Scheduler

- 전용 글로벌 스케줄러 3LT 로 적용 확대(3차년도)
  - Micro Service of Multiple Cluster 적용을 위한 추가 작업
  - FaaS 적용을 위한 고도화 작업
  - AI 서비스를 위한 특화된 고도화 작업
- GM-Center와 보다 유기적인 통합작업
  - Monitoring API 통합작업
  - 사용자별 Workspace/Project에 따른 스케줄링 가능하도록 통합 작업
- 글로벌 스케줄러 기능 세부 평가 및 안정화
- 글로벌 스케줄링 처리속도 고속화 작업(grpc)
- 글로벌 스케줄러 기존 개발된 정책별 성능 평가
- 추가 스케줄러 정책 적용



2 GS-Scheduler : System Structure



감사합니다.

http://gedge-platform.github.io

GS-Engine 프레임워크 코어 개발자 (GS-Scheduler)
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