

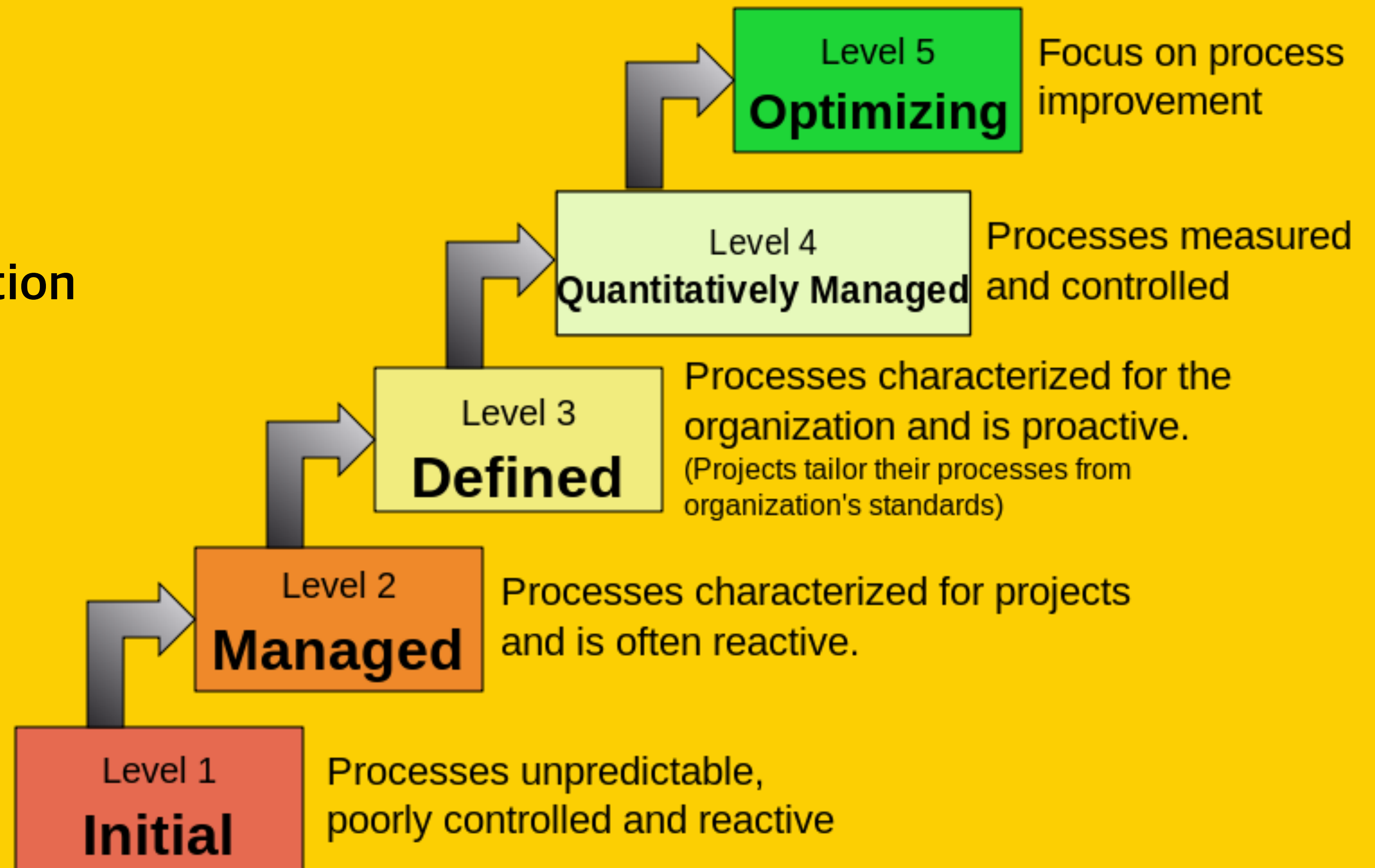
From Openstack To Cloud Native

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How Far did you go with your cloud?

CMMI Model

Capability Maturity Model Integration
developed by CMU



How Far did you go with your cloud? like Kakao

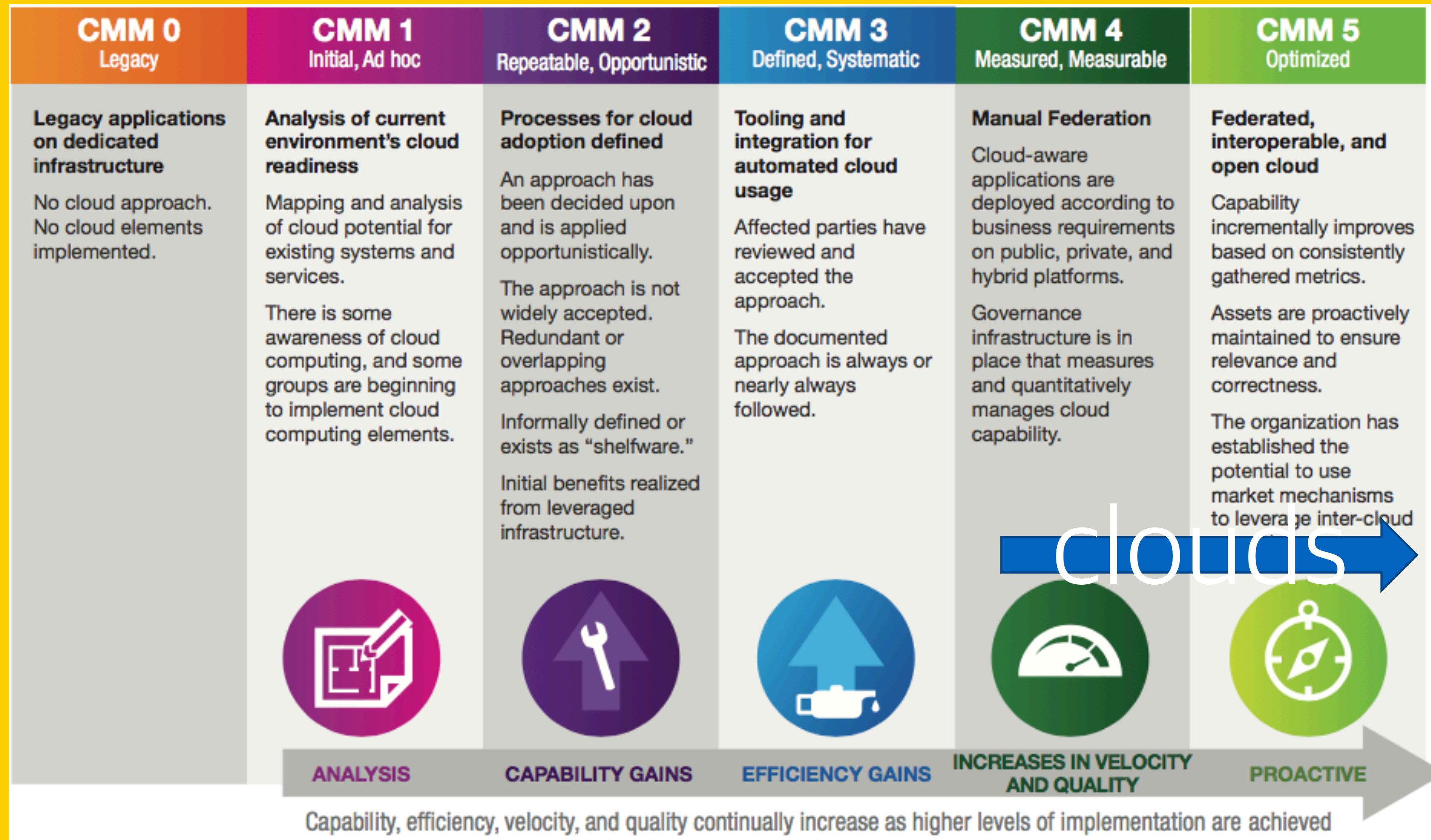
Cloud Producer: CMMI Dev perspective

Targets
Maturity

	Initial	Managed	Defined	Quantitatively Managed	Optimizing
Culture & Organization	<ul style="list-style-type: none">Teams organized based on platform/technologyDefined and documented processes	<ul style="list-style-type: none">One backlog per teamAdopt agile methodologiesRemove team boundaries	<ul style="list-style-type: none">Extended team collaborationRemove boundary dev/opsCommon process for all changes	<ul style="list-style-type: none">Cross-team continuous improvementTeams responsible all the way to production	<ul style="list-style-type: none">Cross functional teams
Build & Deploy	<ul style="list-style-type: none">Centralized version controlAutomated build scriptsNo management of artifactsManual deploymentEnvironments are manually provisioned	<ul style="list-style-type: none">Polling CI buildsAny build can be re-created from source controlManagement of build artifactsAutomated deployment scriptsAutomated provisioning of environments	<ul style="list-style-type: none">Commit hook CI buildsBuild fails if quality is not met (code analysis, performance, etc.)Push button deployment and release of any releasable artifact to any environmentStandard deployment process for all environments	<ul style="list-style-type: none">Team priorities keeping codebase deployable over doing new workBuilds are not left brokenOrchestrated deploymentsBlue Green Deployments	<ul style="list-style-type: none">Zero touch Continuous Deployments
Release	<ul style="list-style-type: none">Infrequent and unreliable releasesManual process	<ul style="list-style-type: none">Painful infrequent but reliable releases	<ul style="list-style-type: none">Infrequent but fully automated and reliable releases in any environment	<ul style="list-style-type: none">Frequent fully automated releasesDeployment disconnected from releaseCanary releases	<ul style="list-style-type: none">No rollbacks, always roll forward
Data Management	<ul style="list-style-type: none">Data migrations are performed manually, no scripts	<ul style="list-style-type: none">Data migrations using versioned scripts, performed manually	<ul style="list-style-type: none">Automated and versioned changes to datastores	<ul style="list-style-type: none">Changes to datastores automatically performed as part of the deployment process	<ul style="list-style-type: none">Automatic datastore changes and rollbacks tested with every deployment
Test & Verification	<ul style="list-style-type: none">Automated unit testsSeparate test environment	<ul style="list-style-type: none">Automatic Integration TestsStatic code analysisTest coverage analysis	<ul style="list-style-type: none">Automatic functional testsManual performance/security tests	<ul style="list-style-type: none">Fully automatic acceptance testsAutomatic performance/security testsManual exploratory testing based on risk based testing analysis	<ul style="list-style-type: none">Verify expected business valueDefects found and fixed immediately (roll forward)
Information & Reporting	<ul style="list-style-type: none">Baseline process metricsManual reportingVisible to report runner	<ul style="list-style-type: none">Measure the processAutomatic reportingVisible to team	<ul style="list-style-type: none">Automatic generation of release notesPipeline traceabilityReporting historyVisible to cross-silo	<ul style="list-style-type: none">Report trend analysisReal time graphs on deployment pipeline metrics	<ul style="list-style-type: none">Dynamic self-service of informationCustomizable dashboardsCross-reference across organizational boundaries

How Far did you go with your cloud? like Kakao

Cloud Consumer: CMMI Cloud Perspective



Cloud CMMI1-KRANE

What is the sole purpose of doing IaaS?

CMM0	CMM1
legacy	self service Dev resource
output: ITF	output: krane (openstack cloud)

Krane, Kakao Infra As A Service

Self service 기반 인프라 API

오픈소스(오픈스택) 기반 가상머신 클라우드
가상머신, 데이터 베이스, 로드밸런서 생성
IMS, 케미를 통한 가상머신 데이터 자동 관리
32bit network 적용으로 확장성/안정성이 높음

가상 머신

centos, ubuntu OS 제공
스냅샷 제공
volume 기능 제공

데이터베이스

mysql, redis, mongodb 제공
daily backup 제공

네트워크

플로팅 IP 기능을 통한 public IP 제
로드밸런서(장비/소프트웨어) 제공

VM 오케스트레이션

vm 오토스케일링 서비스 제공



Cloud CMMI2-KEMI

What is the sole purpose of doing MaaS?

CMM0	CMM1	CMM2
legacy	self service Dev resource	limited Prod resources
output: cloudTF	output: krane (openstack cloud)	output: kemi (MaaS)

KEMI, Kakao Monitoring As A Service

모니터링용 클라우드

- 전사 컴퓨팅/네트워크 리소스 및 퍼블릭 클라우드 데이터 수집/측정(measuring) 클라우드
- API를 통한 리소스 정보 조회 및 알림 설정 가능

KEMI Stats

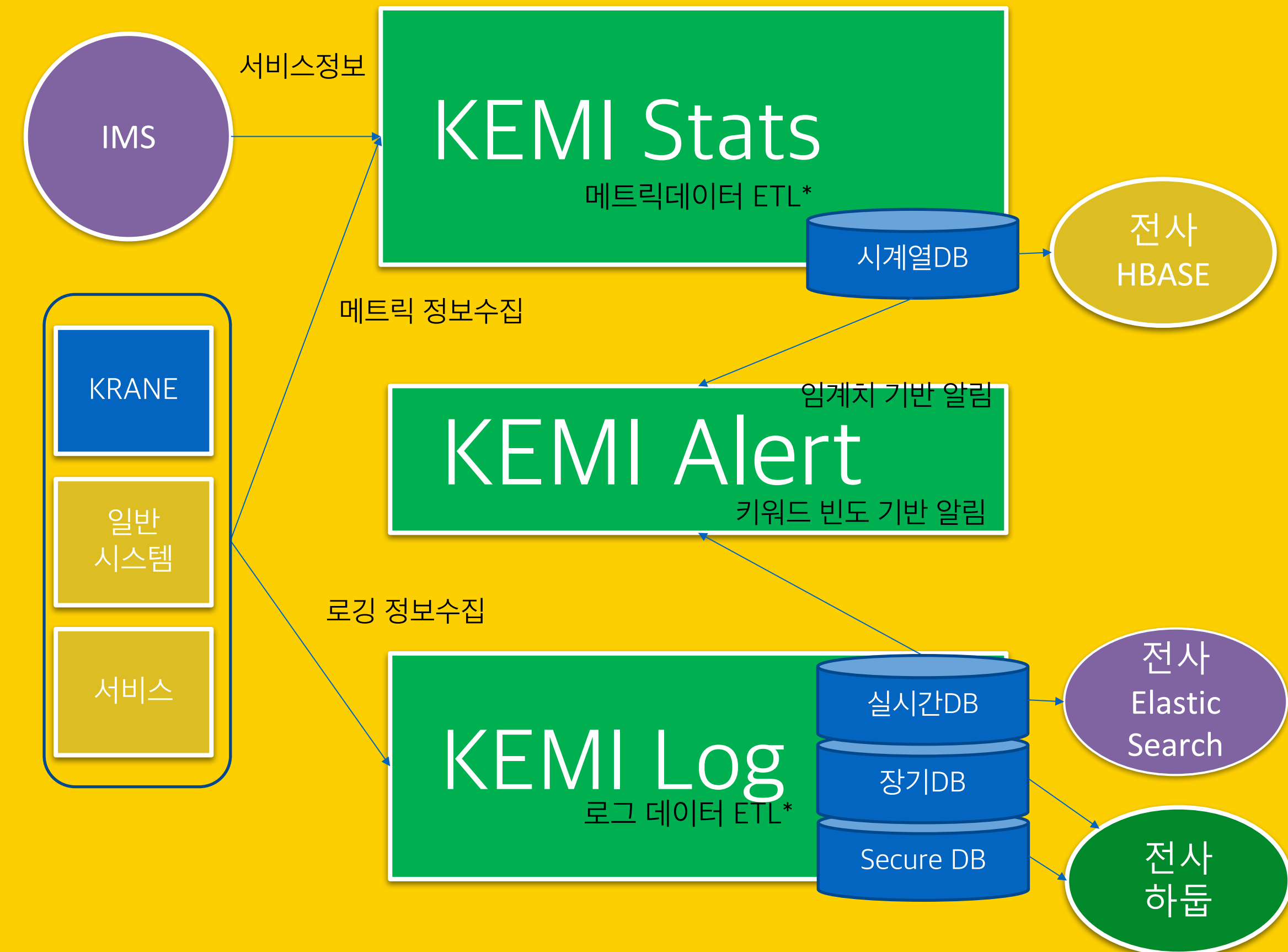
- IMS기반 전사 리소스 데이터 수집
- 물리/가상/컨테이너/클라우드/app 데이터 수집
- rule기반 데이터 계산

KEMI Log

- 물리/가상/컨테이너/클라우드/app 로그데이터 수집
- 실시간, 장기 데이터 별도 저장 (supported by 하둡 엔지니어링 파트)
- 개인정보 데이터 저장소 별도 제공

KEMI Alert

- stat 데이터는 임계치 기반, 로그 데이터는 키워드/빈도기반 알림 설정 api 제공
- watch center 알림외에 custom url 알림 설정가능



ETL: Extract Transform Loading

CMMI3-DKOS

What is the sole purpose of doing CaaS?

CMM0	CMM1	CMM2	CMM3
legacy	self service Dev resource	limited Prod resources	Automated CloudUsage
output: cloudTF	output: krane (openstack cloud)	output: kemi (MaaS)	output: DKOS (CaaS)

DKOS, Kakao Container As A Service

컨테이너용 클라우드

- 컨테이너 CI/CD 서비스
- 컨테이너를 이용한 개발/배포/서비스 사이클 지원
- 키스톤인증 사용
- 인프라 API는 KRANE을, 메트릭/로깅은 KEMI를 기반으로 개발

컨테이너 오케스트레이션 제공

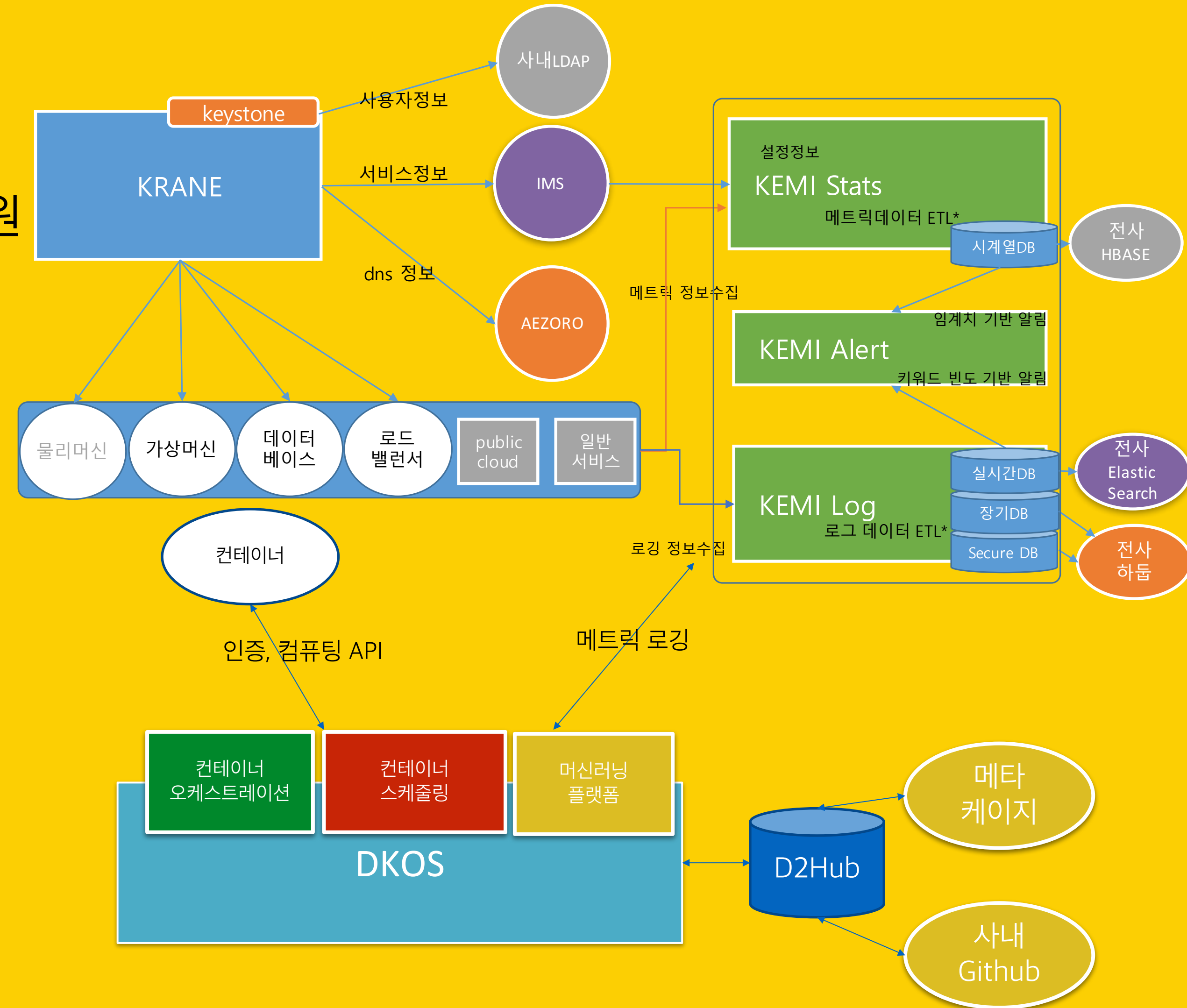
- 컨테이너 HA제공
- 컨테이너 확장 및 자동 복구 제공
- 서비스 디스커버리 및 로드밸런서 제공
- 자동 컨테이너 빌드 및 배포 (CI/CD) 제공

컨테이너기반 스케줄링 서비스 제공

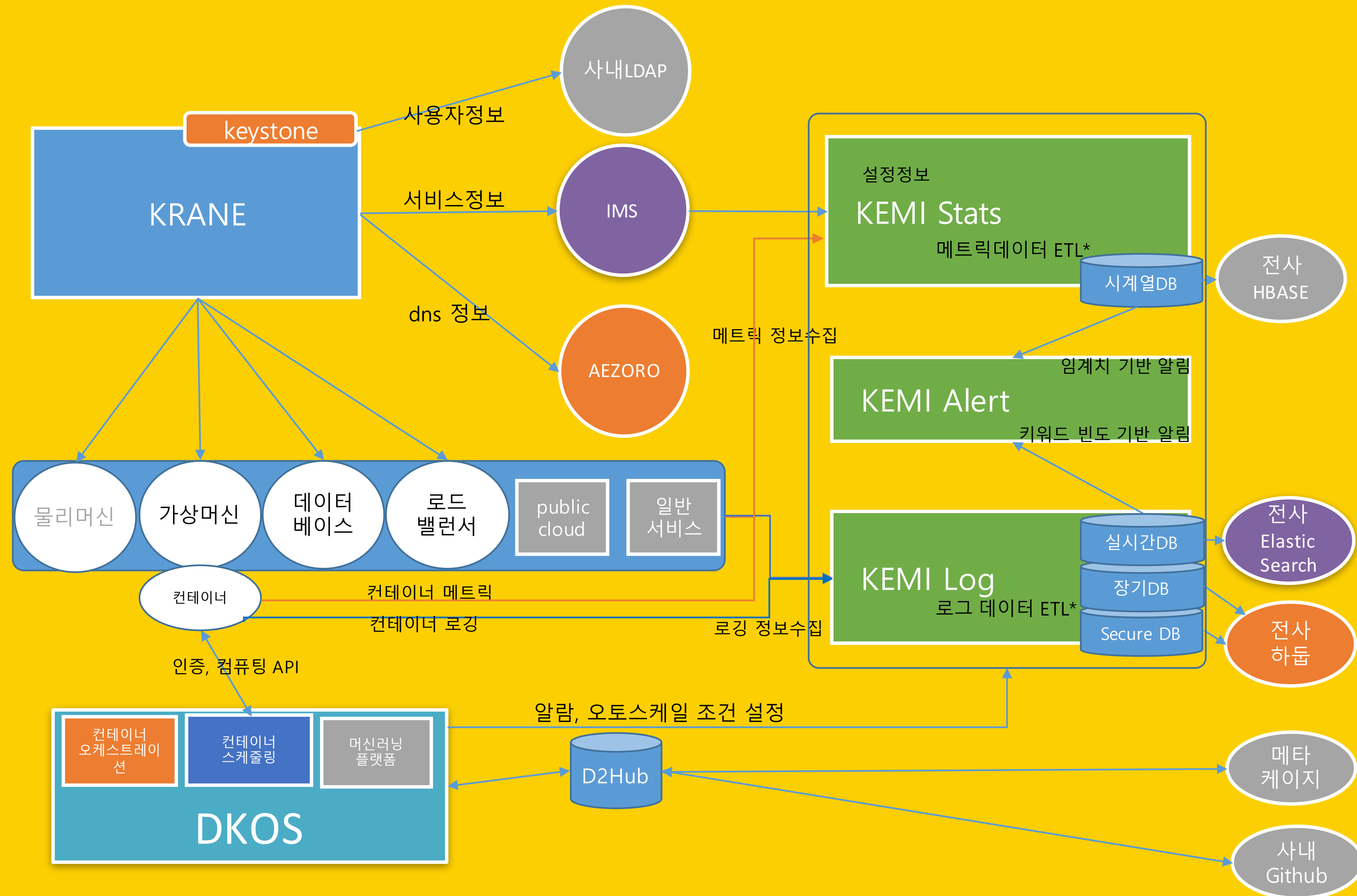
특정 시간/횟수별 작업(컨테이너기반) 실행기능

머신러닝 플랫폼 제공(베타)

스파크 프로비저닝가능



Kakao Cloud is connected to everything



Product & Service in Kakao Cloud

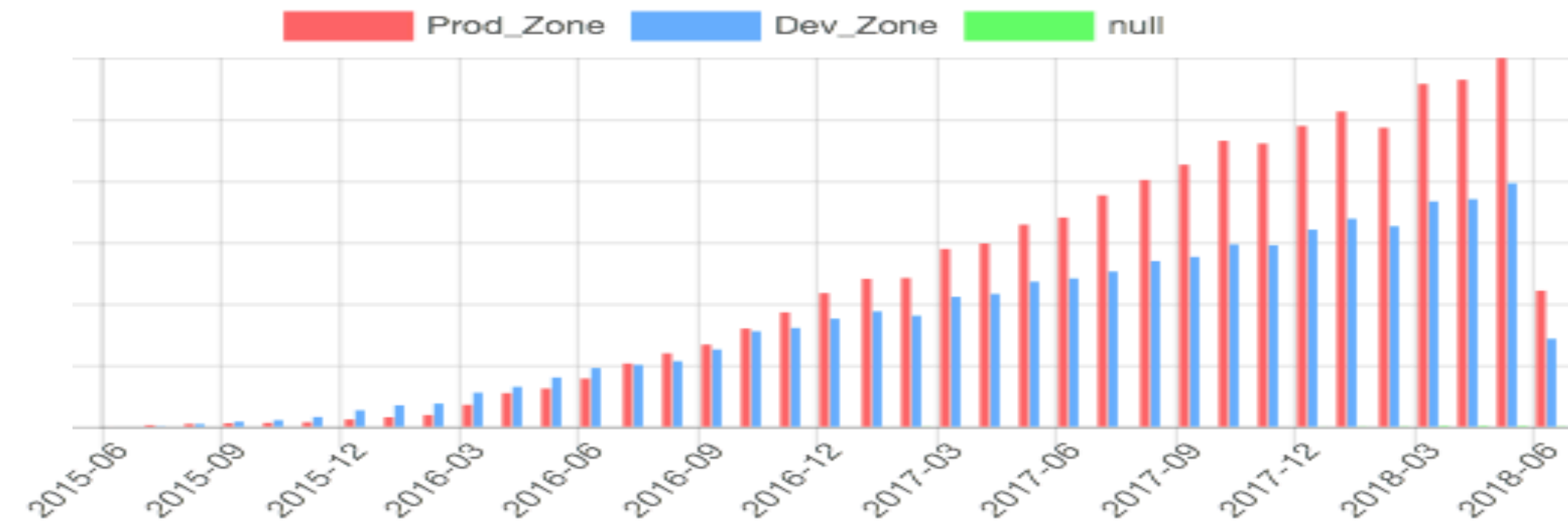
Category	Target	Product	Description	Connected internal service
Authentication	Role based Authentication	KEYSTONE	롤기반 사용자 관리	내부 LDAP와 연동
Compute	Virtual machine	KRANE	가상머신 제공 가상 볼륨, 가상머신 기반 DB/LB제공 Autoscale 기능 준비중	IMS, *AEZORO, *Meta-kage 연동 *Ceph-Tenth 연동
	Container	DKOS	컨테이너 orchestrator(marathon) 제공. 컨테이너용 Loadbalancer 제공 컨테이너기반 Machine learning framework제공 (Spark, GPU)	KRANE, KEMI, AEZORO 와 연동
Management	Monitoring	KEMI Stats	전사 메트릭 데이터 (cpu, memory, disk) & custom (application, component) 데이터 수집 및 분석	*IMS와 연동 sauron 연계
	Logging	KEMI Log	전사 로그 데이터 (syslog, app, container) 로그 수집/저장/분석	IMS와 연동 공용 하둡, Hbase연동
	Alert	KEMI Alert	KEMI 데이터 기반 알람(톡 및 url 전송)	
Developer tools	Package Repository	rep.kakao.com	OS 패키지, Python/Ruby 패키지 제공	
	Container Registry / Builder	D2Hub	컨테이너용 이미지 제작 및 등록	Keystone 연동
	DNS as a service	AEZORO	가상머신/컨테이너기반 DNS 자동 등록/삭제	내부 DNS연동

*AEZORO(사내 DNS as a Service API)
*IMS(Infra Management System)
*Meta-kage(swift[오픈스택 스토리지 API]용 kage)
*Ceph-Tenth(Ceph API 호환 Tenth 스토리지)

Kakao cloud is smearing

KRANE instances : 2x,xxx

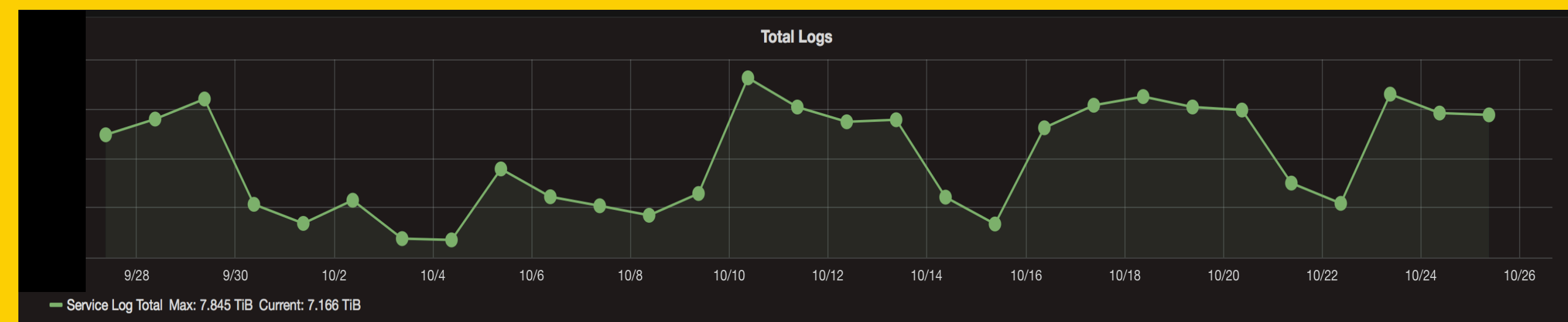
VM instances cpu usage per zone (inhouse)



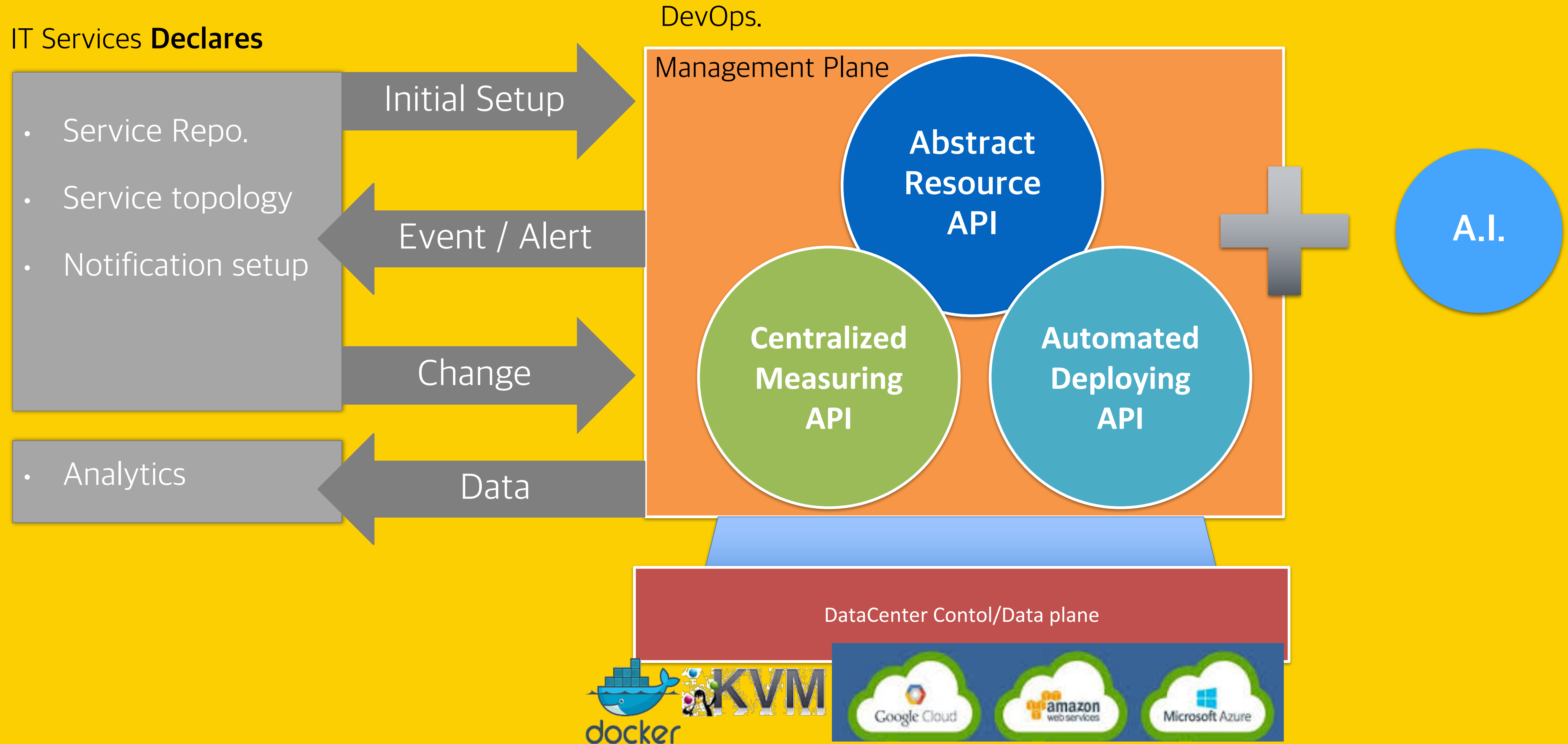
DKOS containers : 1x,xxx



KEMI log Index : 30TB / day
650 Services

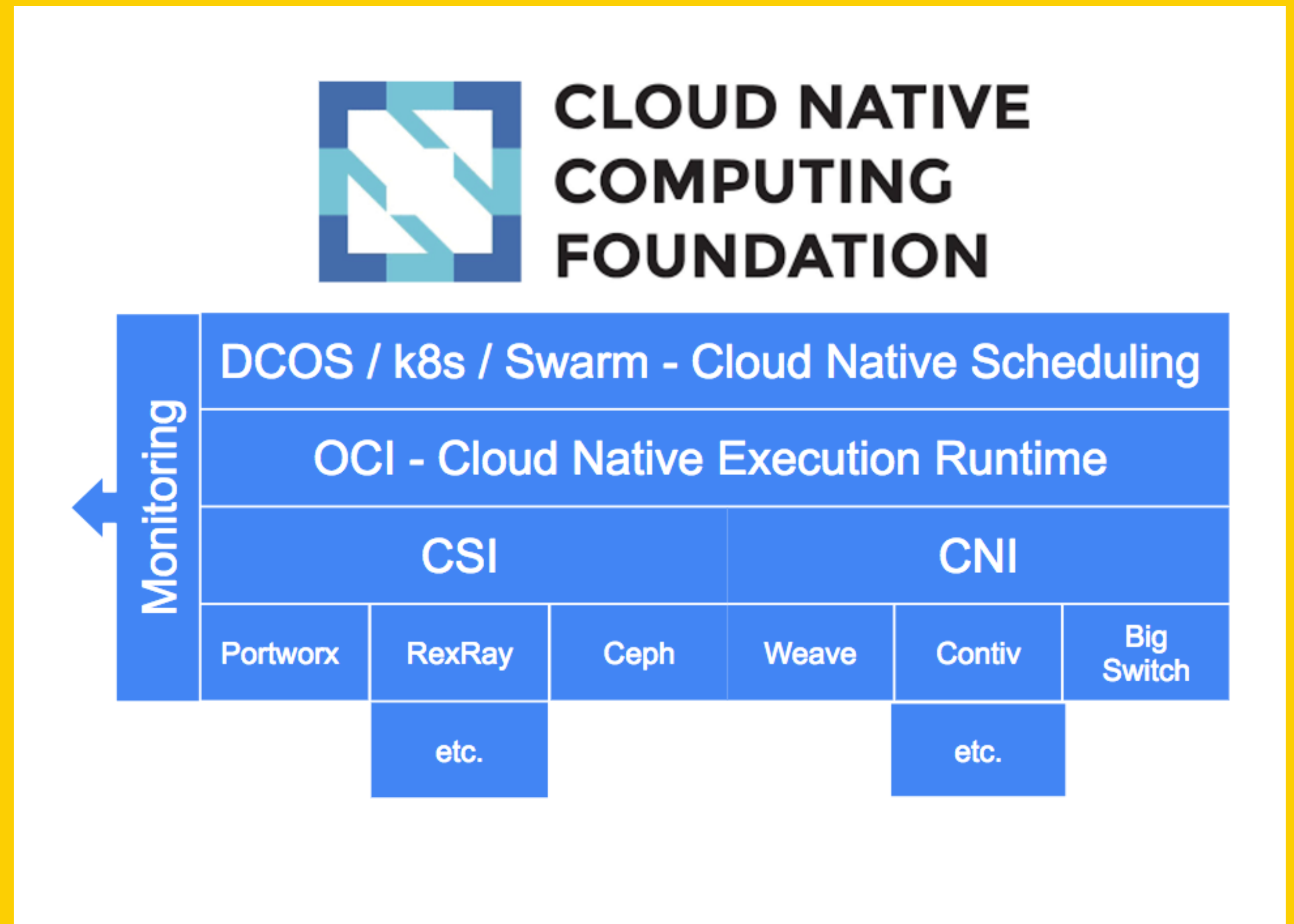


Resource Management is heading for self driving



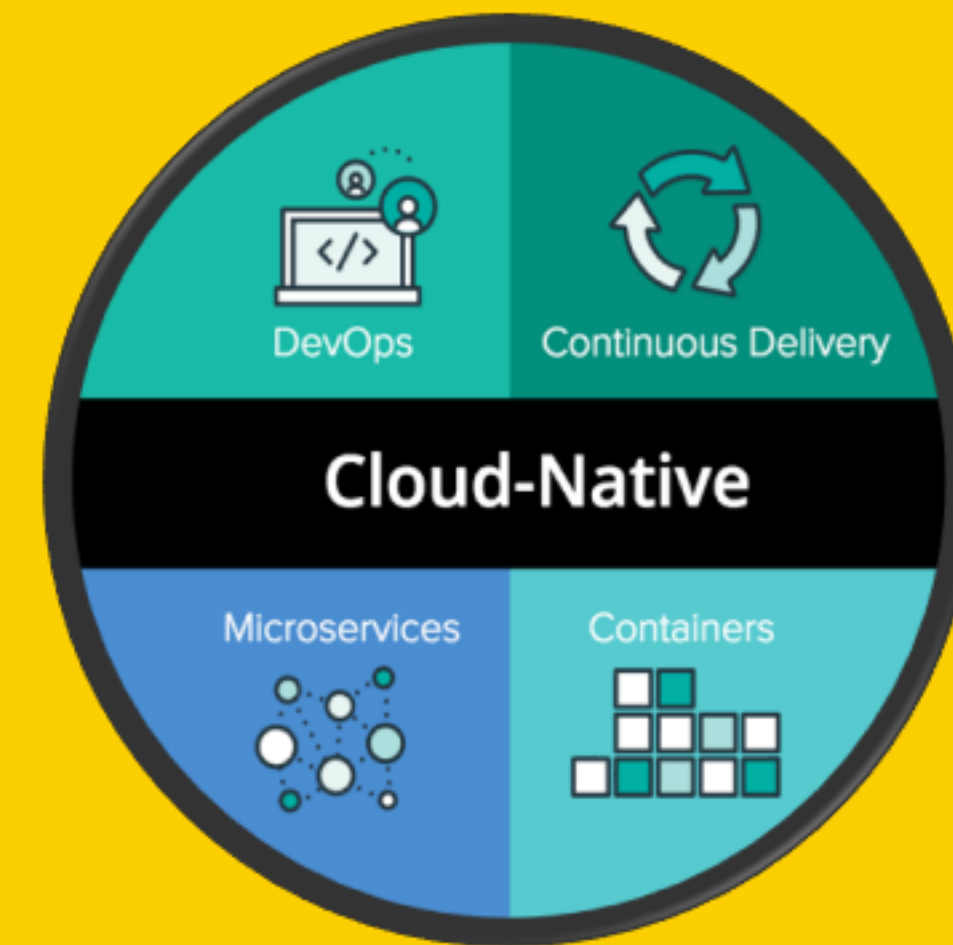
BTW

- What is cloud native?
- Containerized
- Dynamically orchestrated
- Microservice oriented



Little bit more specific

- Cloud Native Applications Characteristics
 - Microservices
 - Health Reporting
 - Telemetry Data
 - Resiliency
 - Declarative



<https://pivotal.io/cloud-native>)

Characteristics to Requirement

- Cloud Native Applications Characteristics

- Microservices
- Health Reporting
- Telemetry Data
- Resiliency
- Declarative



- Platform Requirement

- Isolation
- Resource Allocation and Scheduling
- Service Discovery
- Monitoring/Logging
- Metric Aggregation
- Debugging and Tracing

Requirement to function mapping

Cloud Native Applications Characteristics

- Microservices
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Platform Requirement

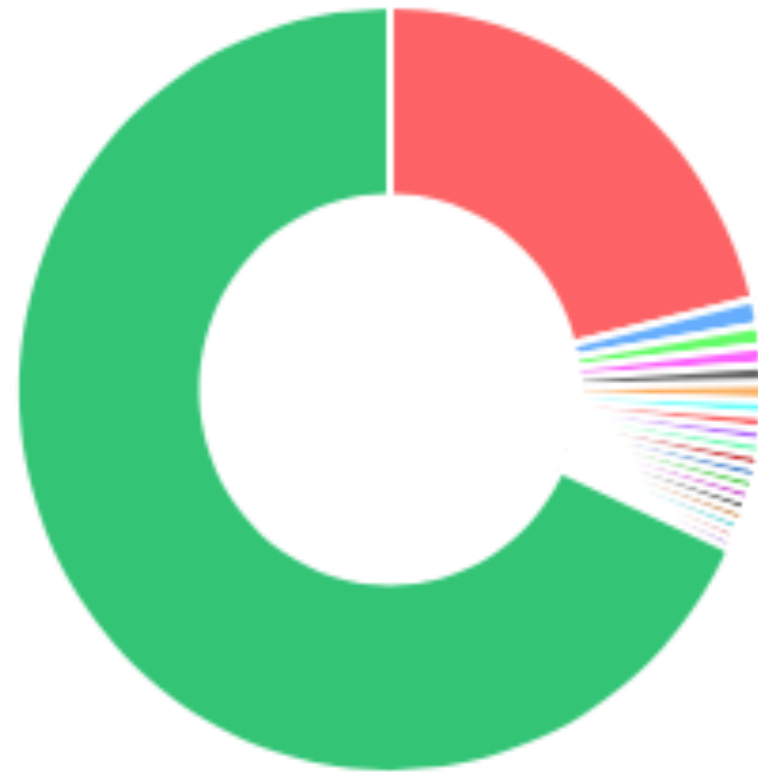
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	DNS as a service	AEZORO	가상머신/컨테이너기반 DNS 자동 등록/삭제

Container rules the cloud

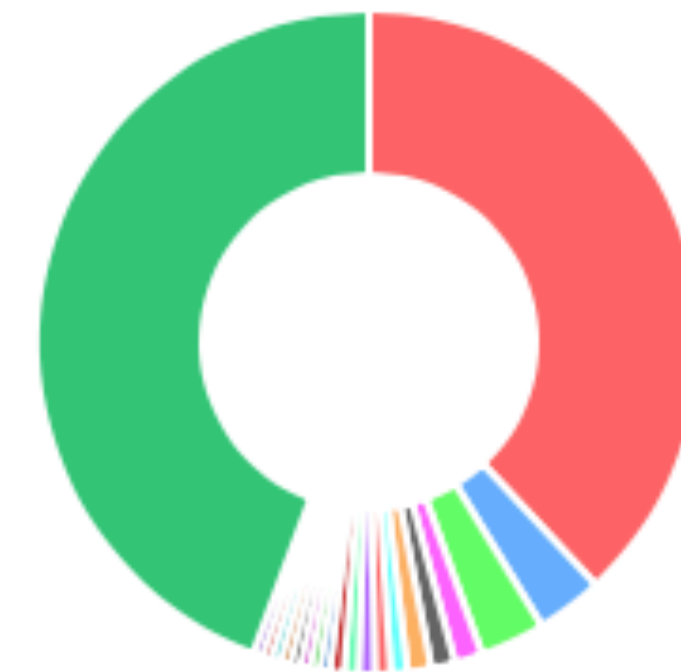
VM Instances cpu usage per projects (inhouse - Dev_Zone)

DKOS-v2



VM Instances cpu usage per projects (inhouse - Prod_Zone)

DKOS-v2



Reset the target by CMM4

- Integrated Monitoring System
 - VM/PM/CONTAINER/APPLICATION
 - Telemetry/Logging
- Event PipeLine
- Embracing Other Cloud Services

Reset the target by CMM4

CMM0	CMM1	CMM2	CMM3	CMM4
Planning	self service Dev resource	limited Prod resources	Automated CloudUsage	Integrated Management over Clouds
output: TF	output: krane (openstack cloud)	output: kemi (MaaS)	output: DKOS (CaaS)	output: Cloud Native Platform (9rum)

9rum(Rebooted)



서비스를 개발하면서 부딪히는 갖가지 문제들,
9rum.cc 서비스로 극복하세요.

LDAP ID

Password

로그인

- Link -

KRANE

Compute

go

DKOS

Compute

go

KEMI Log

Management

go

KEMI Metric

Management

go

D2hub

Developer Tools

go

애조로

Developer Tools

go

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reboot.9rum.cc

Link

Compute

Management

Developer tools

당신의 9rum.cc 현황을 전달해 드립니다.

Home

Issue

Issue 발생

Issue 종료(5분전)

OK

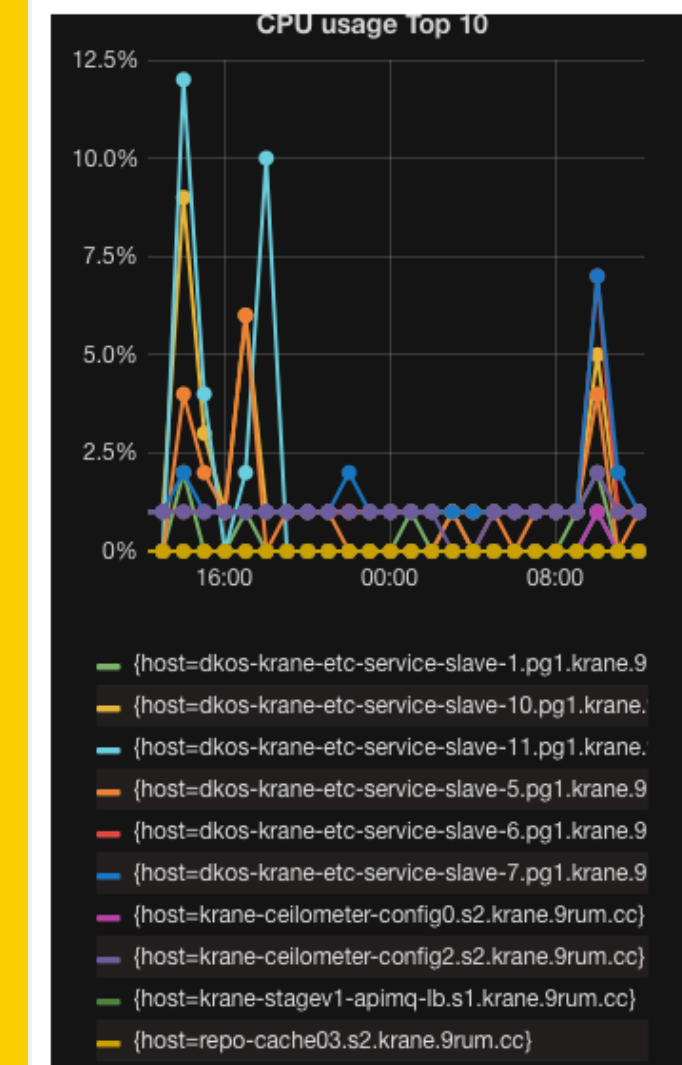
UnKnown



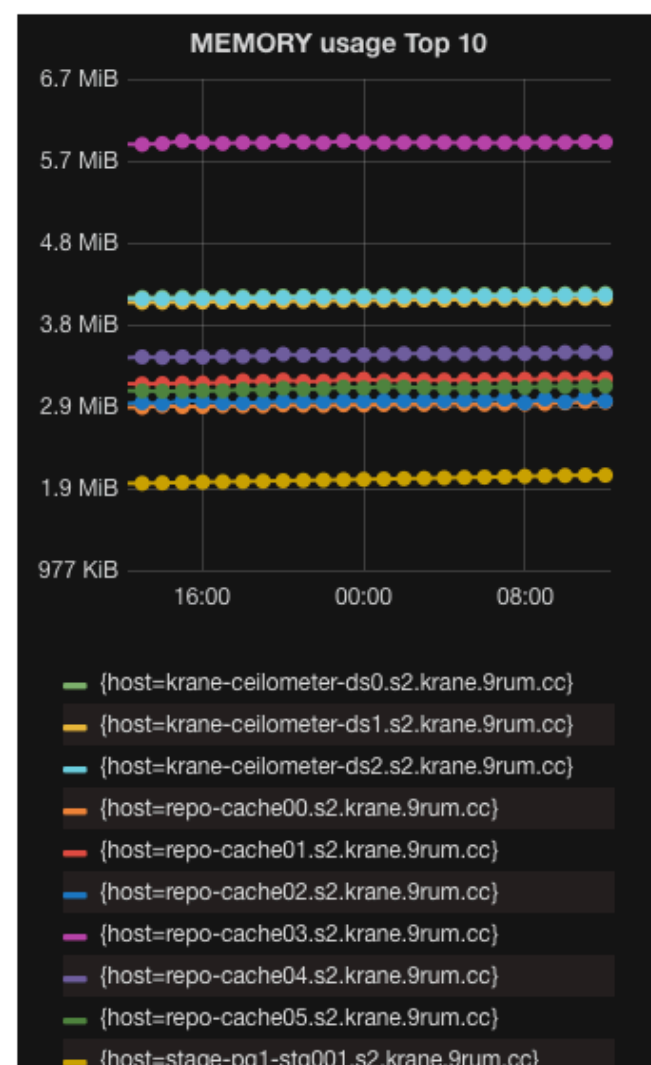
Instance	
FQDN	Region
testseoulv25-172efb64.pg1.krane.9rum.cc	seoul-v2
상태 : ACTIVE	IP : 10.198.17.144 (Dev_Zone)
생성 일시 : 2018-03-06 12:59:59	수정 일시 : 2018-03-06 13:00:10
testseoulv25-60fbafa6.pg1.krane.9rum.cc	seoul-v2
상태 : ACTIVE	IP : 10.198.17.126 (Dev_Zone)
생성 일시 : 2018-03-06 12:59:59	수정 일시 : 2018-03-06 13:00:13
testseoulv25-d8becb0c.pg1.krane.9rum.cc	seoul-v2
상태 : ACTIVE	IP : 10.198.17.150 (Dev_Zone)
생성 일시 : 2018-03-06 12:59:59	수정 일시 : 2018-03-06 13:00:10

Resource(Top 10)

Metric detail



Metric detail



Thanks and QnA