

Teknologi Cloud Native Dibalik Layar Penanganan Pandemi

Talk #9 IOID2021

Yoga Hanggara

Head of Engineering at **Jabar Digital Service**

Bandung, August 21, 2021

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About Me



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www.openstack.id

Agenda

- Introduction
- Challenges
- What is Cloud Native
- Our Journey
- Measure Success



INDONESIA
OpenInfra Days

Introduction

Jabar Digital Service

About West Java

3.7m ha

One of the biggest
provinces in Indonesia

49+ Mil

20% of the entire
Indonesian population

18 Regencies

9 Cities

627 districts

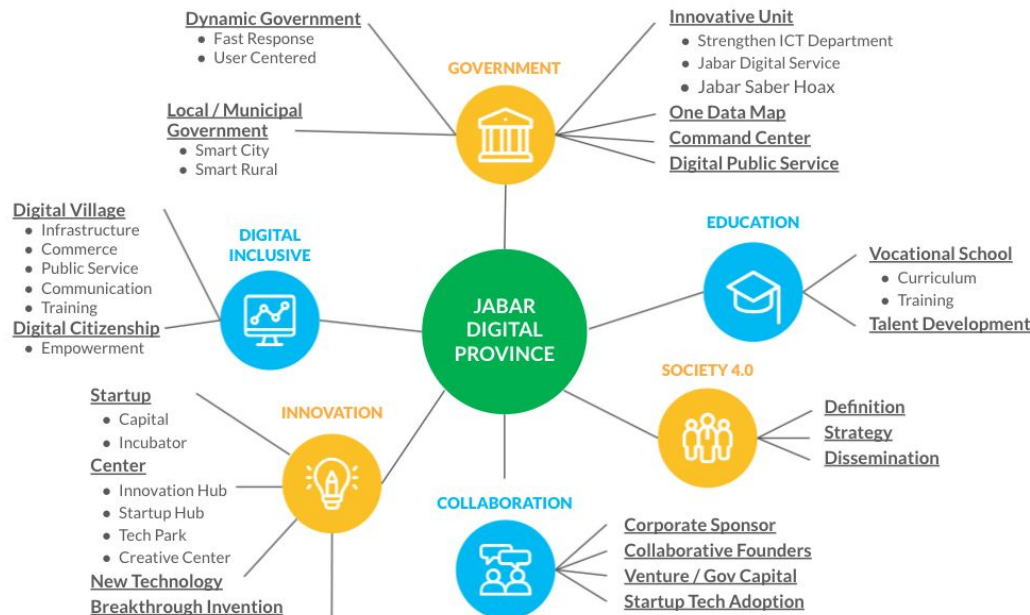
5.312 villages

645 sub-districts





Towards a Digital Province



Our Mission



Data for Decision Support System

Mewujudkan pengambilan kebijakan berdasarkan data.



Government Digital Transformation

Mengakselerasi transformasi digital pemerintahan.



Improving Citizens Digital Experience

Mempermudah kehidupan masyarakat dengan teknologi digital.



Our Mission



Top quality technology for world class public services.



JABAR
DIGITAL
SERVICE



Challenges

Challenges: Digital Public Services

Kompas.com

PPDB Jakarta 2021 Dihentikan Sementara Hari Ini hingga Pukul 12.00 WIB - Kompas.com

Slamet membantah bahwa situs web PPDB DKI Jakarta disebut down atau error. Sebab, menurut dia, sebagian data pendaftar sudah masuk.

3 days ago



Metro Tempo.co

5 Fakta PPDB DKI Jakarta: Sistem Error hingga Waktu Pendaftaran Diperpanjang

Kebanyakan warganet mengeluh soal sistem bernama Sidanira itu yang sulit diakses. "Sekelas DKI sistem PPDB down sudah satu jam. Gimana ...

2 days ago



detikNews

Situs PPDB Jakarta 2021 Sulit Diakses, Disdik DKI: Ada Pelambatan

"Data kami sudah mencatat juga beberapa CPDB sudah sukses mendaftar dan memilih sekolah. Jadi tidak ada down ya," tegasnya. Baca juga: ...

4 days ago



Medcom.id

Hari Pertama PPDB DKI Server Sempat Down

Hari Pertama PPDB DKI, Server Sempat Down ... Jakarta: Hari pertama Penerimaan Peserta Didik Baru (PPDB) Tahun Pelajaran 2021/2022 di ...

4 days ago



<https://wartakota.tribunnews.com> › Jakarta › Warta Metro ▾

Server Pendaftaran PPDB Down, Sejumlah Orang Tua ...

Jun 7, 2021 — Server penerimaan peserta didik baru (PPDB) mengalami kendala tidak bisa diakses. Hal ini pun menyulitkan orang tua untuk mendaftar.

<https://metro.tempo.co> › read › ppdb... ▾ [Translate this page](#)

PPDB Online Banten Tak Bisa Diakses, Server Down - Metro ...

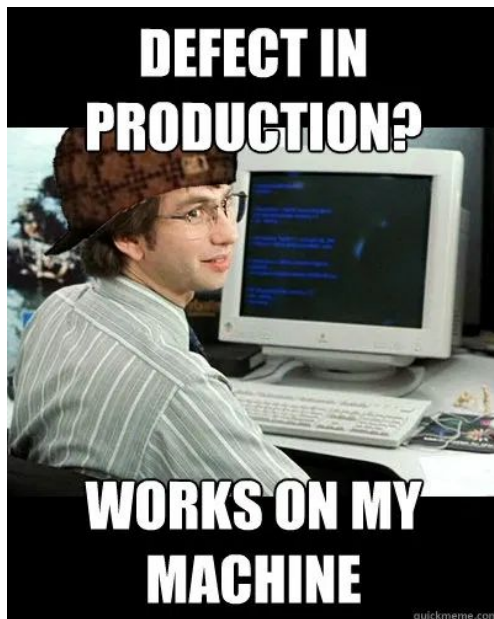
Jun 21, 2021 — Pendaftaran PPDB Online 2021 untuk jalur zonasi Sekolah Menengah Atas Negeri (SMAN) di Provinsi Banten dimulai hari ini.

<https://www.merdeka.com> › jakarta ▾ [Translate this page](#)

Ombudsman Temukan Masalah PPDB DKI: Server Down dan ...

Jun 7, 2021 — Akan tetapi, karena sarver yang down akibat banyaknya akses yang dilakukan secara bersamaan, Zonasi PPDB, Ragam Konten, Penerimaan siswa baru ...

Programmer & Operation's Problem



Programmer & Operation's Problem





IT Infrastructure Challenges

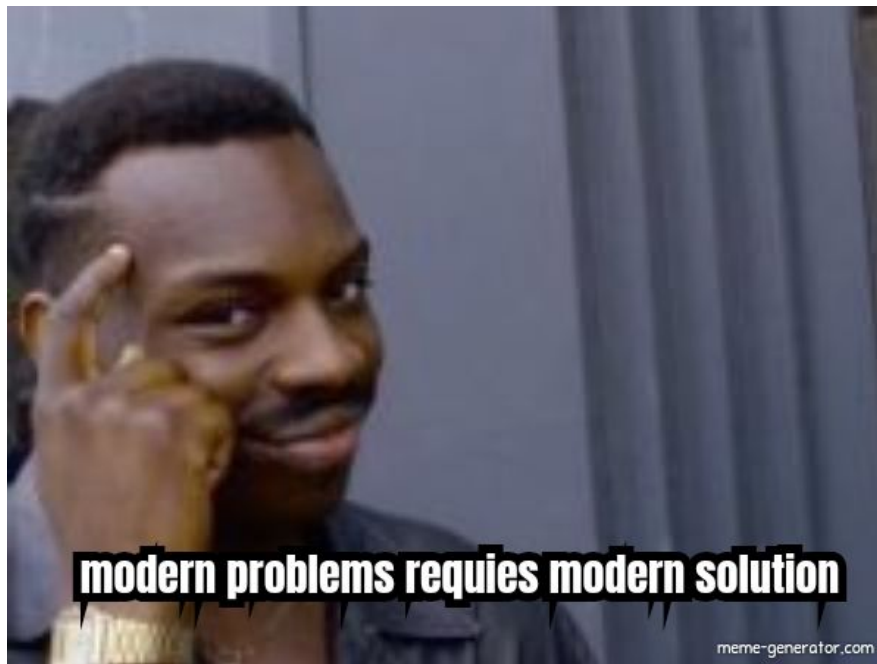
- Difficult to plan capacity .
- Inefficiencies in IT expenditure (initial setup cost).
- Operational and maintenance costs.
- Limited human resources (infrastructure operations).
- Information security risks.



Development Challenges

- Pandemic, *unprepared* digital health system.
- Rapid apps digital-tools development.
- Work from home, remote working on government

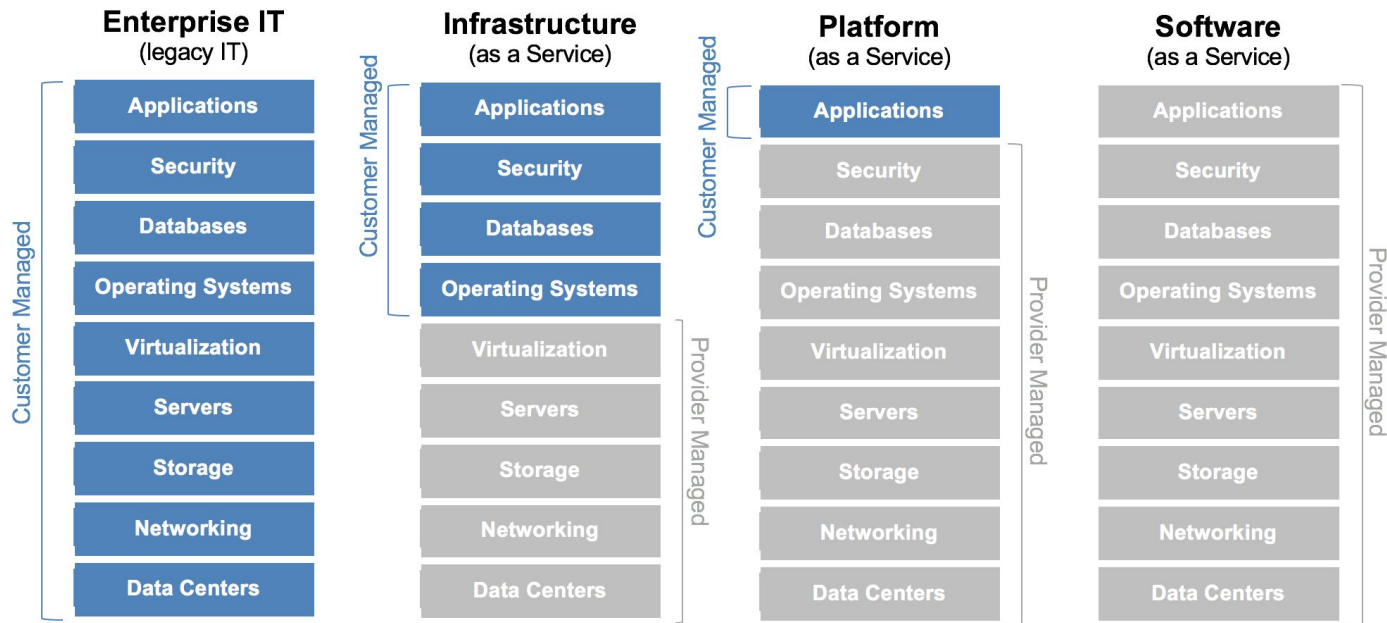
Not only develop apps, but build reliable services



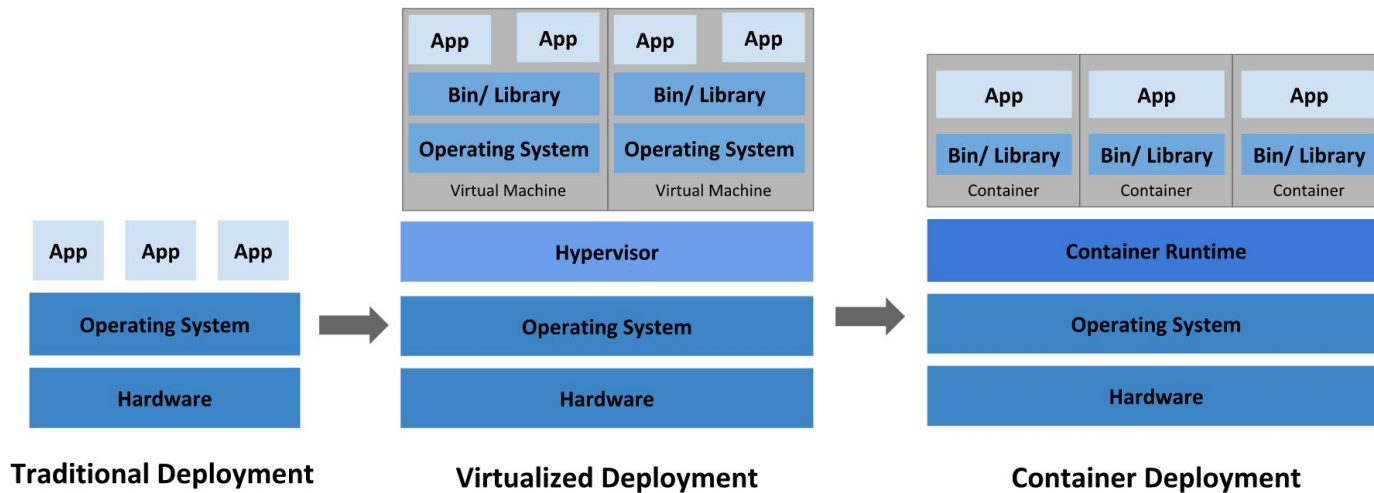
What is Cloud-Native?

Is It Hype or The Future of Software Development?

Cloud Computing



Container Deployment Era



What is Cloud-Native?

Cloud native technologies empower organizations to build and run scalable applications in modern, dynamic environments such as public, private, and hybrid clouds.

Containers, service meshes, microservices, immutable infrastructure, and declarative APIs exemplify this approach.

These techniques enable loosely coupled systems that are resilient, manageable, and observable. Combined with robust automation, they allow engineers to make high-impact changes frequently and predictably with minimal toil. Source: [CNCF](#)

What is Cloud-Native?

“Cloud native is an approach to building and running applications that fully exploit the advantages of the cloud computing model.”

Source: [Pivotal](#)

What is Cloud-Native?

Cloud native is a lot more than just signing up with a cloud provider and using it to run your existing applications.

It affects the design, implementation, deployment, and operation of your application.



Cloud-Native Keywords

- High availability
- Dynamic environments, elastic
- Loosely coupled systems
- Scalable
- Resilient
- Manageable, observable
- Automation, frequently changes



Cloud-Native Application

- **Operability:** Expose control of application/system lifecycle.
- **Observability:** Provide meaningful signals for observing state, health, and performance.
- **Elasticity:** Grow and shrink to fit in available resources and to meet fluctuating demand.
- **Resilience:** Fast automatic recovery from failures.
- **Agility:** Fast deployment, iteration, and reconfiguration

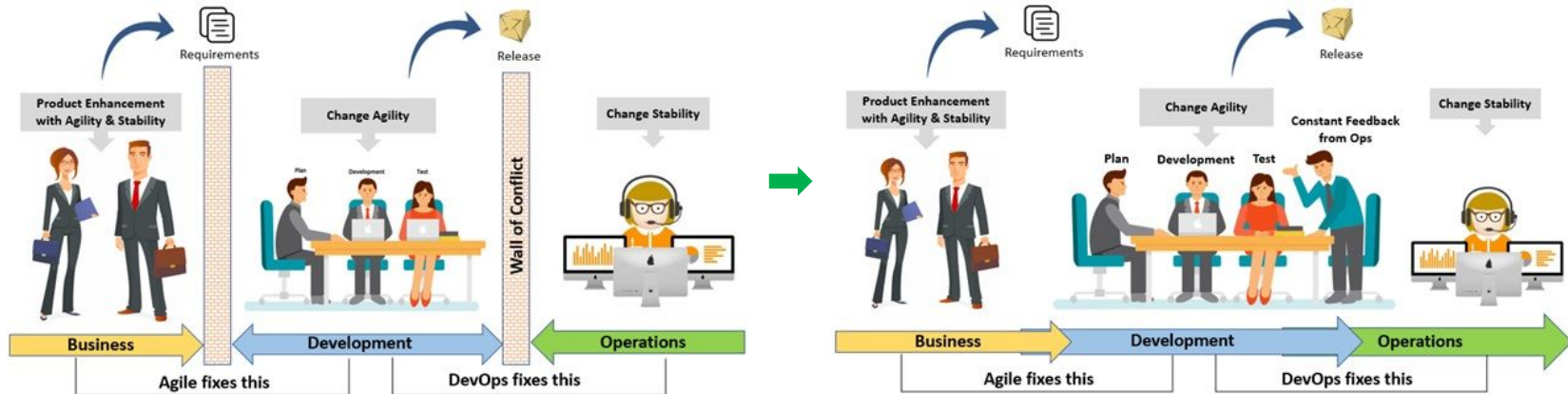
Our Journey

From Legacy IT to Modern Solutions

Before 2019	Traditional On-Premise Deployment Colocation Server, Bare metals
2019-2020	Infrastructure as a Service Virtual Machine, Private Cloud Container technology, Adopt Cloud Native, Swarm, CI/CD.
2021	Platform & Function as a Service DevOps as a culture High Availability with Zonal-Regional public/hybrid cloud. Serverless, Fargate, Kubernetes Cost efficiency.
Future	Software as a Service

DevOps as a Culture

Breaking down silos between Development & Operations



Source: [Accenture](#)

Setup Dynamic Environments

Private Cloud



JABAR CLOUD

1. Government Private Data
2. Data Pipeline, Data Lake
3. Core Data & Master Data Management

Public Cloud



1. Public information service
2. High Availability & Scalable Service
3. High-Performance Computing

App Development: Cloud Native Trail Map

Trail Map

The Cloud Native Trail Map provides an overview for enterprises starting their cloud native journey.

1. Containerization
2. CI/CD
3. Orchestration
4. Observability
5. Service Discovery
6. Network & Policy
7. Distributed database & storage
8. Streaming & messaging
9. Container Registry
10. Software distribution



CLOUD NATIVE TRAIL MAP

The Cloud Native Landscape [Landscape](#) has a large number of options. This Cloud Native Trail Map is a recommended process for leveraging open source, cloud native technologies. At each step, you can choose a vendor-supported offering or do it yourself, and everything after step #3 is optional based on your circumstances.

HELP ALONG THE WAY

A. Training and Certification

Consider training offerings from CNCF and then take the exam to become a Certified Kubernetes Administrator or a Certified Kubernetes Application Developer

[cncf.io/training](#)



1. Containerization: 12-Factor App

Guidelines to build app optimized for cloud environment (cloud-native).

Code

1. One Codebase

One codebase tracked in revision control, many deploys.

2. Dependencies

Explicitly declare and isolate dependencies

3. Config

Store config in the environment

4. Processes

Execute the app as one or more stateless processes.

Deploy

5. Backing Services

Treat backing services as attached resources.

6. Build, Release, Run

Strictly separate build and run stages.

7. Dev/Prod Parity

Keep development, staging, and production as similar as possible.

8. Port Binding

Export services via port binding.

Operate

9. Concurrency

Scale out via the process model

10. Disposability

Maximize robustness with fast startup and graceful shutdown.

11. Logs

Treat logs as event streams.

12. Admin Processes

Run admin tasks as one-off processes.

Source: <https://12factor.net/>

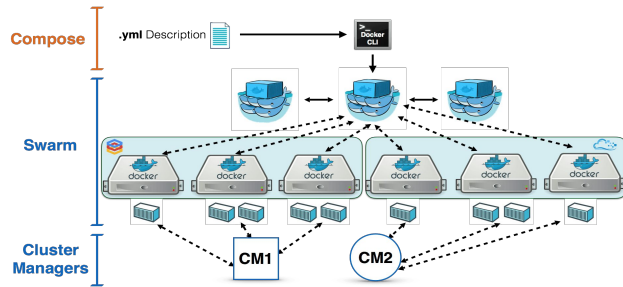
2. Continuous Integration & Delivery (CI/CD)

Deliver incremental release frequently, predictably

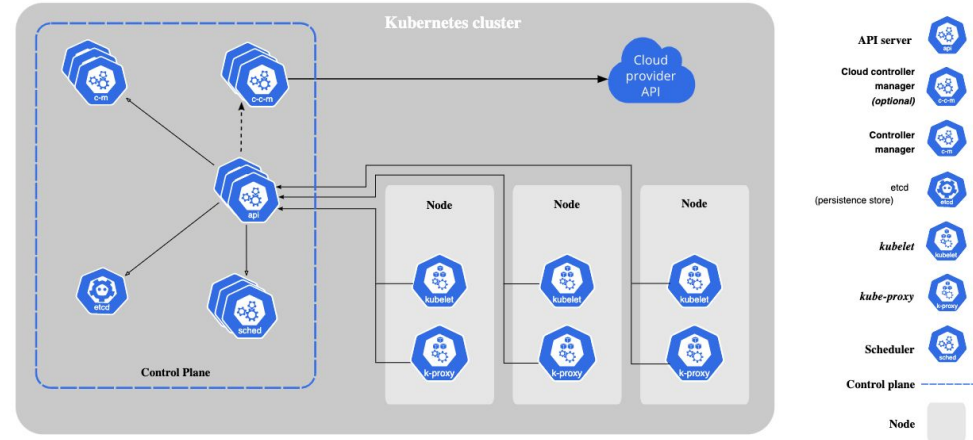
Continuous Integration	Continuous Delivery	Continuous Deployment	Continuous Monitoring
<ol style="list-style-type: none">1. Code review & Pull Request Approval2. Automated coding standard checking (maintainability)3. Automated unit & functional (API) testing with code coverage check4. Automated end-to-end testing5. Security testing6. Load/stress testing	<ol style="list-style-type: none">1. Git Branch (Git Flow, Trunk Based)2. CI/CD Pipeline script3. Automatic versioning4. Automatic build5. Automatic release	<ol style="list-style-type: none">1. Automatic deploy to staging/QA2. Automatic deploy to production3. Canary release	<ol style="list-style-type: none">1. Centralized logging2. Infrastructure logging, uptime, utilization, monitoring, & alert3. Application performance monitoring & alert4. Error logging & alert5. Synthetic monitoring6. Google analytics7. Release health & adoption monitor

3. Orchestration

Managing the life cycles of containers, especially in large, dynamic environments.



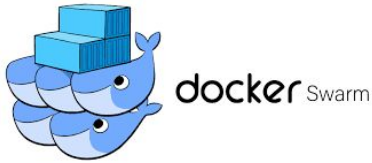
Light Workload: Docker Swarm



Medium-Heavy Workload: Kubernetes

3. Orchestration

Managing the life cycles of containers, especially in large, dynamic environments.



Caprover



AWS ECS



Cloud Run



Amazon
Lambda



HashiCorp
Terraform

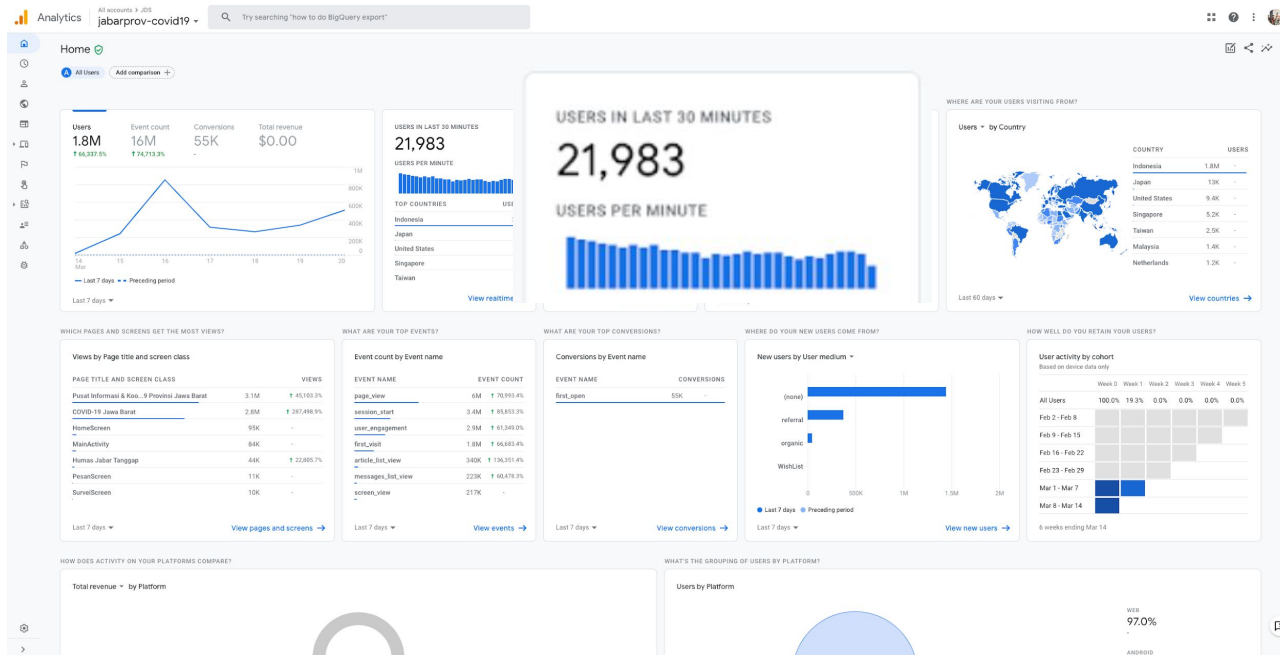
4. Observability

Monitoring, logging, tracing.



Measure Success

Monitoring User Analytics



Uptime Monitoring

We have OKR, service uptime > 99%



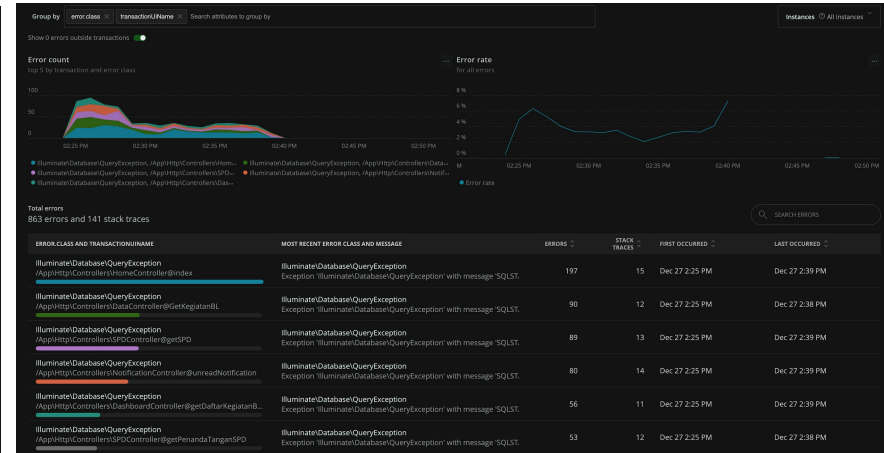
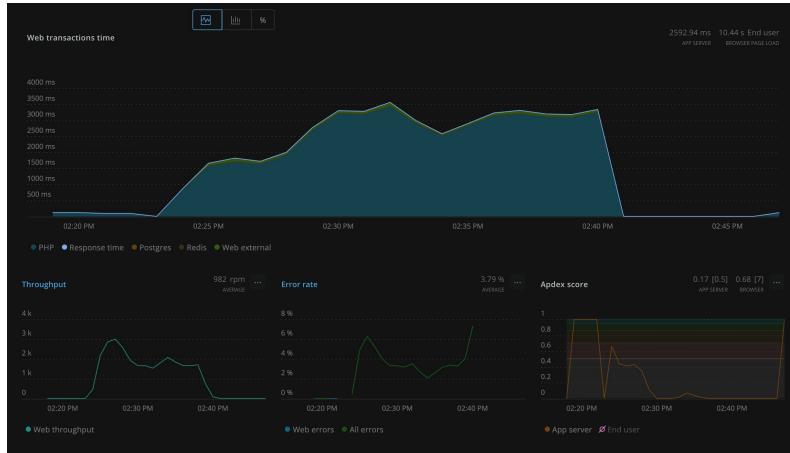
Pikobar Pelaporan Web →	99.999%	<div></div>	● Up
Pikobar Solidaritas Web →	99.999%	<div></div>	● Up
Pikobar Tes Masif API →	99.993%	<div></div>	● Up
Pikobar Tes Masif Microsit...	99.998%	<div></div>	● Up
Pikobar Tes Masif Web Ad...	99.998%	<div></div>	● Up
Pikobar Tracking Web →	99.979%	<div></div>	● Up

Load Testing with Locust

Swarm Users: 1000
Spawn Rate: 10 users/sec
Duration: 5 menit



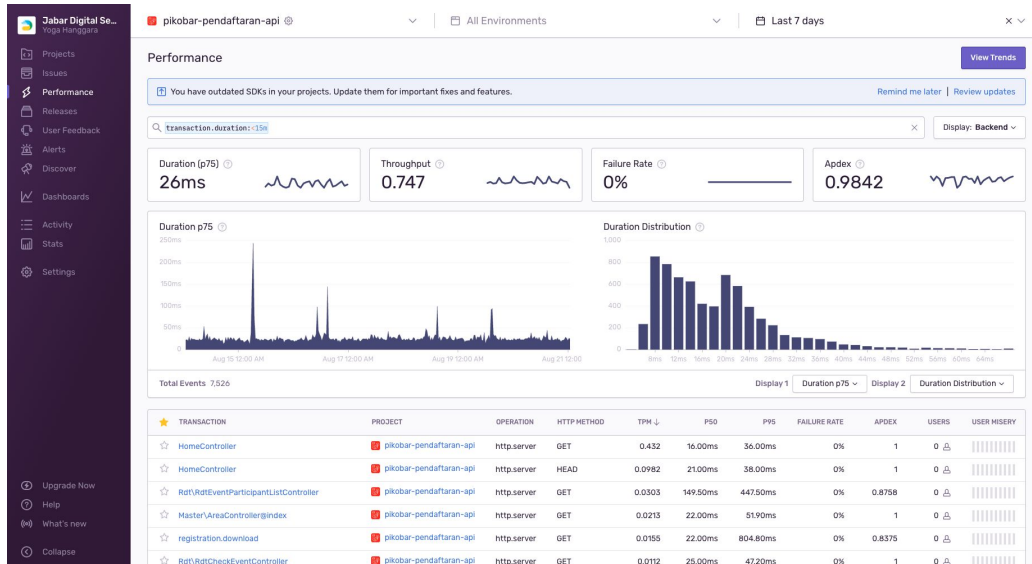
Application Performance Monitoring



Metrics:

Apdex score, throughput, transaction rate, error rate, response time, etc.

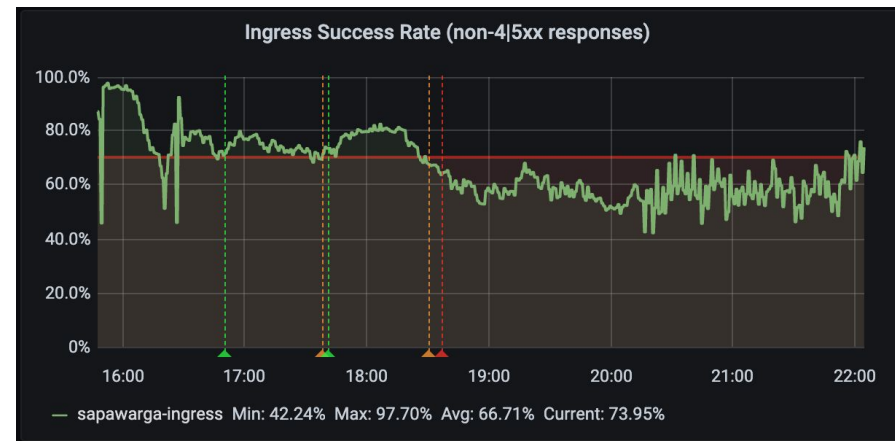
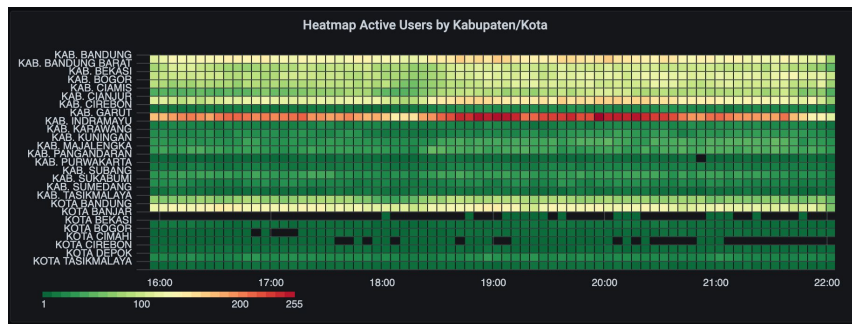
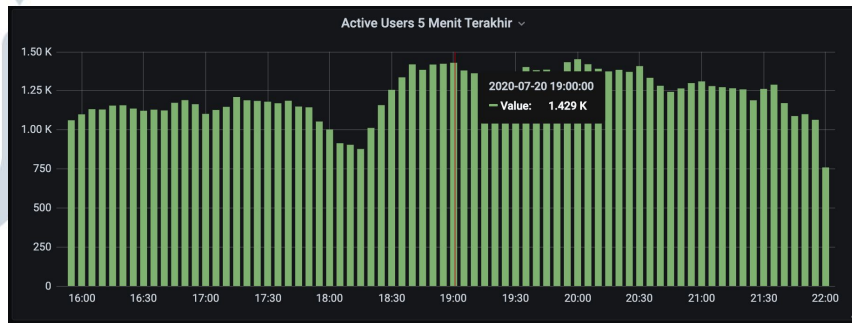
Application Performance Monitoring



Metrics:

Apdex score, throughput, transaction rate, error rate, response time, etc.

We still learning too



Apps not fully optimized.



We're Hiring!



- Backend Engineer
- Frontend Engineer
- DevOps Engineer
- Software QA
- Software Architect
- etc.

Send your best portfolio to yoga.hanggara@ids.jabarprov.go.id

Visit <https://digitalservice.jabarprov.go.id/karir/>

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