



## Teknologi Cloud Native Dibalik Layar Penanganan Pandemi

## Talk #9 101D2021

Yoga Hanggara Head of Engineering at Jabar Digital Service

**NVIDIA**.

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Bandung, August 21, 2021

# About Me



### Yoga Hanggara

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# Agenda

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







# Introduction

Jabar Digital Service







## About West Java



## **3.7**m ha

One of the biggest provinces in Indonesia



20% of the entire Indonesian population

**18** Regencies **9** Cities



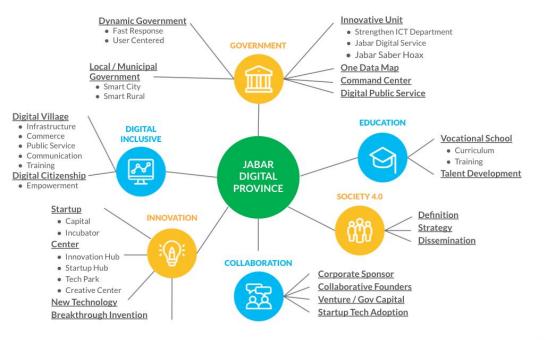




# **Towards a Digital Province**









WBRI EasyStack & Biznet SciCous Deer Conclusion Control Conclusion

# **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.



ଔBRI





# **Our Mission**



Top quality technology for world class public services.









# Challenges







## **Challenges: Digital Public Services**



#### 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 eror. Sebab, menurut dia, sebagian data pendaftar sudah masuk. 3 days ago

#### T 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 milih sekolah. Jadi tidak ada down ya," tegasnya. Baca juga: ... 4 days ago

#### a 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 ...

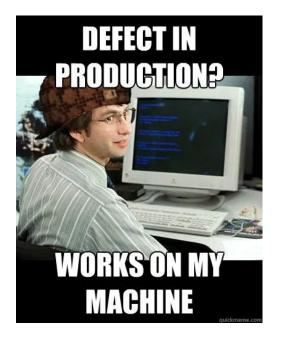






**Programmer & Operation's Problem** 











## **Programmer & Operation's Problem**









## IT Infrastructure Challenges



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- 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**



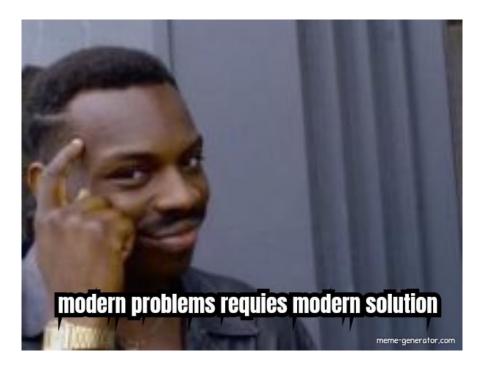
- Pandemic, *unprepared* digital health system.
- Rapid apps digital-tools development.
- Work from home, remote working on government





### Not only develop apps, but build reliable services











Is It Hype or The Future of Software Development?

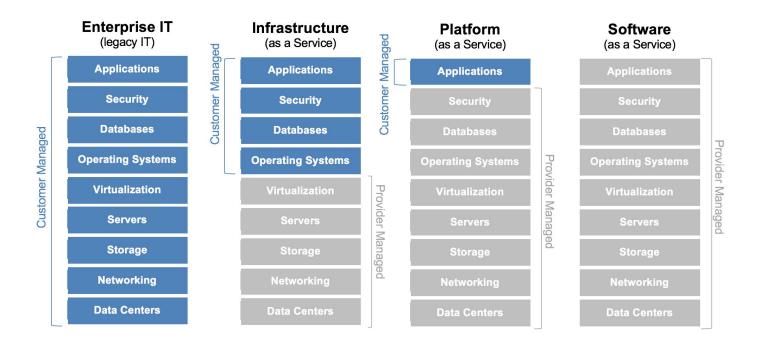






### **Cloud Computing**







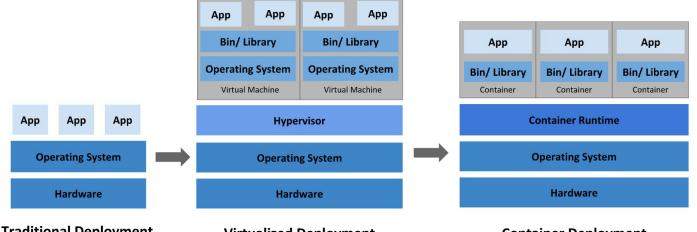


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### **Container Deployment Era**







Virtualized Deployment

**Container Deployment** 

**MBRI** 







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

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

These techniques enable <u>loosely coupled systems</u> that are <u>resilient</u>, <u>manageable</u>, and <u>observable</u>. Combined with robust <u>automation</u>, they allow engineers to make high-impact <u>changes frequently</u> and <u>predictably</u> with minimal toil. <u>source: CNCF</u>





"Cloud native is an approach to building and running applications that fully exploit the <u>advantages of the cloud computing model.</u>"

Source: Pivotal







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

It affects the <u>design</u>, <u>implementation</u>, <u>deployment</u>, and <u>operation</u> of your application.





# **Cloud-Native Keywords**



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





# **Cloud-Native Application**



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**boer** technology

- **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	<b>Infrastructure as a Service</b> Virtual Machine, Private Cloud Container technology, Adopt Cloud Native, Swarm, CI/CD.
2021	<b>Platform &amp; Function as a Service</b> DevOps as a culture High Availability with Zonal-Regional public/hybrid cloud. Serverless, Fargate, Kubernetes Cost efficiency.
Future	Software as a Service





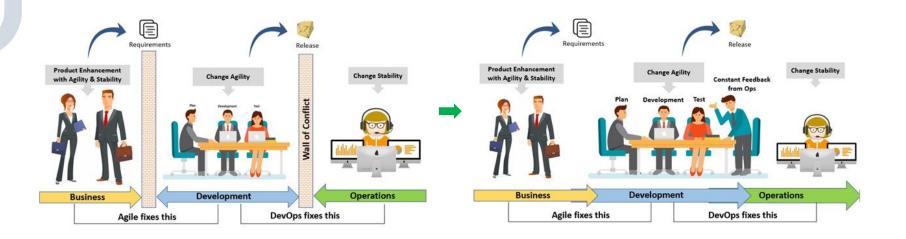
## DevOps as a Culture



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Breaking down silos between Development & Operations



Source: Accenture



## Setup Dynamic Environments



### **Private 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**

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

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

CLOUD NATIVE

#### CLOUD NATIVE TRAIL MAP

The Cloud Native Landkcape Lanckie 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 circomstances.

#### 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 <u>cncf.io/training</u>  Over time, you should aspire towards splitting suitable applications and writing future functionality as microse

1. CONTAINERIZATION

#### 3. ORCHESTRATION & APPLICATION DEFINITION

 Kubernetes is the market-leading orchestration solutio You should select a Certified Kubernetes Distribution, Hoated Platform, or installer: cncf.la/ck Heim Charts help you define, install, and upgrade even the most complex Kubernetes application





 Setup Continuous Integration/Continuous Delivery (CI/CD) so that changes to your source code automatically result in a new container being built, tested, and deployed to staging and eventually, perhaps, to production

Setup automated rollouts, roll backs and testing Argo is a set of Kubernetes-native tools for deploying and running jobs, applications, workflows, and events using GROps paradigms such as continuous and progressive delivery and MLops



#### 4. OBSERVABILITY & ANALYSIS

 Pick solutions for monitoring, logging and tracing Consider CNCF projects Prometheus for monitoring, Fluentd for logging and Jaeger for Tracing For tracing, look for an OpenTracing-compatible implementation like Jaeger







## 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/

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EasyStack SicCloud Check



## 2. Continuous Integration & Delivery (CI/CD)



### Deliver incremental release <u>frequently</u>, <u>predictably</u>

Continuous Integration	Continuous Delivery	Continuous Deployment	Continuous Monitoring		
<ol> <li>Code review &amp; Pull Request Approval</li> <li>Automated coding standard checking (maintainability)</li> <li>Automated unit &amp; functional (API) testing with code coverage check</li> <li>Automated end-to-end testing</li> <li>Security testing</li> <li>Load/stress testing</li> </ol>	<ol> <li>Git Branch (Git Flow, Trunk Based)</li> <li>Cl/CD Pipeline script</li> <li>Automatic versioning</li> <li>Automatic build</li> <li>Automatic release</li> </ol>	<ol> <li>Automatic deploy to staging/QA</li> <li>Automatic deploy to production</li> <li>Canary release</li> </ol>	<ol> <li>Centralized logging</li> <li>Infrastructure logging, uptime, utilization, monitoring, &amp; alert</li> <li>Application performance monitoring &amp; alert</li> <li>Error logging &amp; alert</li> <li>Synthetic monitoring</li> <li>Google analytics</li> <li>Release health &amp; adoption monitor</li> </ol>		

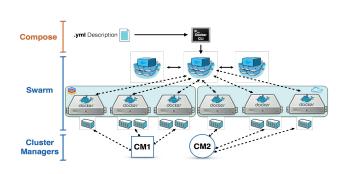


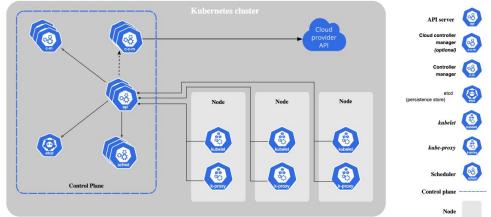


## **3.** Orchestration



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.



## 4. Observability

Monitoring, logging, tracing.

















# **Measure Success**

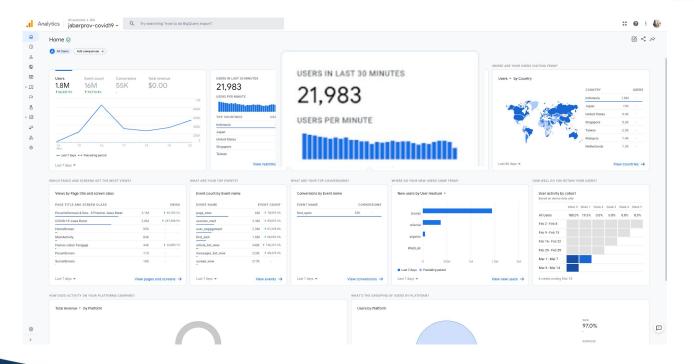






## Monitoring User Analytics









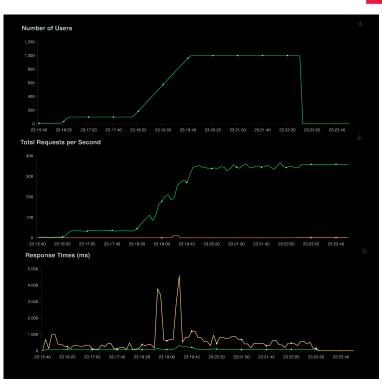
#### **Uptime Monitoring INDONESIA** n ŧi **OpenInfra** Days Pikobar Tes Masif API is operational Uptime Last 90 days We have OKR, service uptime > 99% **Overall Uptime** 100.00% 100.00% 99.998% 99.993% Response Time Last 90 days Pikobar Pelaporan Web > Up Pikobar Solidaritas Web 99.999% 🔵 Up 900.00ms Pikobar Tes Masif API > 99.993% 🕘 Up Pikobar Tes Masif Microsit... 99,998% 🔵 Up 🔍 Up Pikobar Tracking Web → 🕘 Up 99.979%





Load Testing with Locust

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



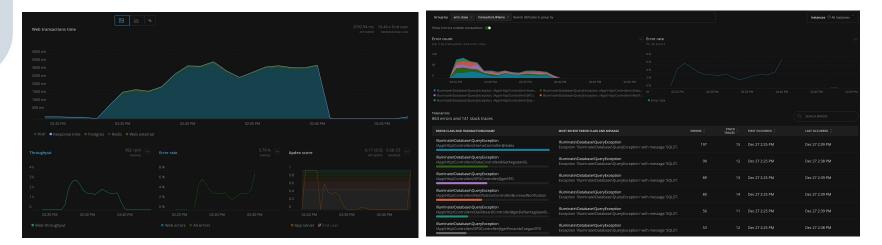






### **Application Performance Monitoring**





### **Metrics:**

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





### **Application Performance Monitoring**



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#### **Metrics:**

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



## We still learning too



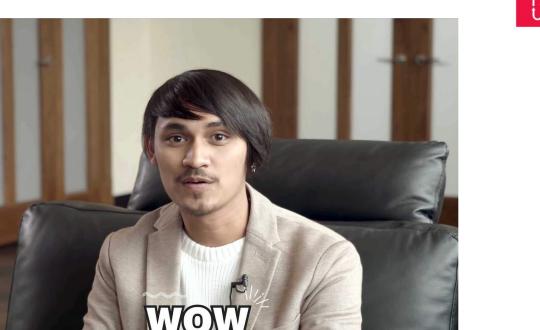




BRI EasyStack () Birnet Stochaus () Broker

Apps not fully optimized.











# We're Hiring!



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

Send	your	best	portfolio	to	<u>yoqa.hanqqara@jds.jabarprov.qo.id</u>
	5		1		

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





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Do you have any questions?

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