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DEVOPS-101

Code. Automate. Deploy. Repeat.

Jared Rowe

Senior DevOps Engineer

Jeremy Bertenshaw

DevOps Engineer

Gift Mkwara

Graduate Engineer

Phocas.

Roadmap

In this session, we're going to cover:

1. Who We Are
2. DevOps Fundamentals
3. Take Home Example Demonstration
4. Q & A

1

Our Journeys into DevOps

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Jared Rowe

Senior DevOps Engineer

Phocas.

Graduated with a BSc in Computer Science from UC.

Worked in a variety of roles in Operations and Systems Engineering.

Switched to Development.

Pivoted into Application Performance Monitoring, and then Solutions Architecture.

Currently at Phocas and fully immersed in a dedicated DevOps role.

Jeremy Bertenshaw

DevOps Engineer

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Also graduated with a BSc in Computer Science from UC.

From personal projects, deployment was clicking "Go" on Vercel.

Joined Phocas and got introduced into the world of production grade infrastructure and CI/CD.

Tried to mimic this with my personal projects, "Why is this so confusing!"

Gift Mkwara

Graduate Engineer

2

DevOps Fundamentals

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What even is DevOps?!

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Core Concepts

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CI/CD

Infrastructure as Code

Containerisation

Observability

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Continuous Integration (CI)

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What is CI?

Is the practice of merging code **frequently** into a central repository with confidence.

An **automated** process ensures that the code is:

- Compiled 🛠️
- Tested ✅
- High quality 🏆
- Style conformant 🎉

Does it build?

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- ✓ Is the language's compiler happy with the source code?
- ✓ For compiled languages run the compiler against the source code.
- ✓ For interpreted languages run tools like type checkers and linters

Do the tests pass?

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- ✓ Run automated tests, *ideally* at all levels
  - Unit
  - Integration
  - End-to-end
- ✓ Report on test coverage.
- ✓ Make failing tests easy to find and diagnose.

Does it meet our standards?

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- ✓ Formatting & Style
- ✓ Linting, Code Smells, Best Practices
- ✓ Static Analysis & Security Checks

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Continuous Delivery (CD)

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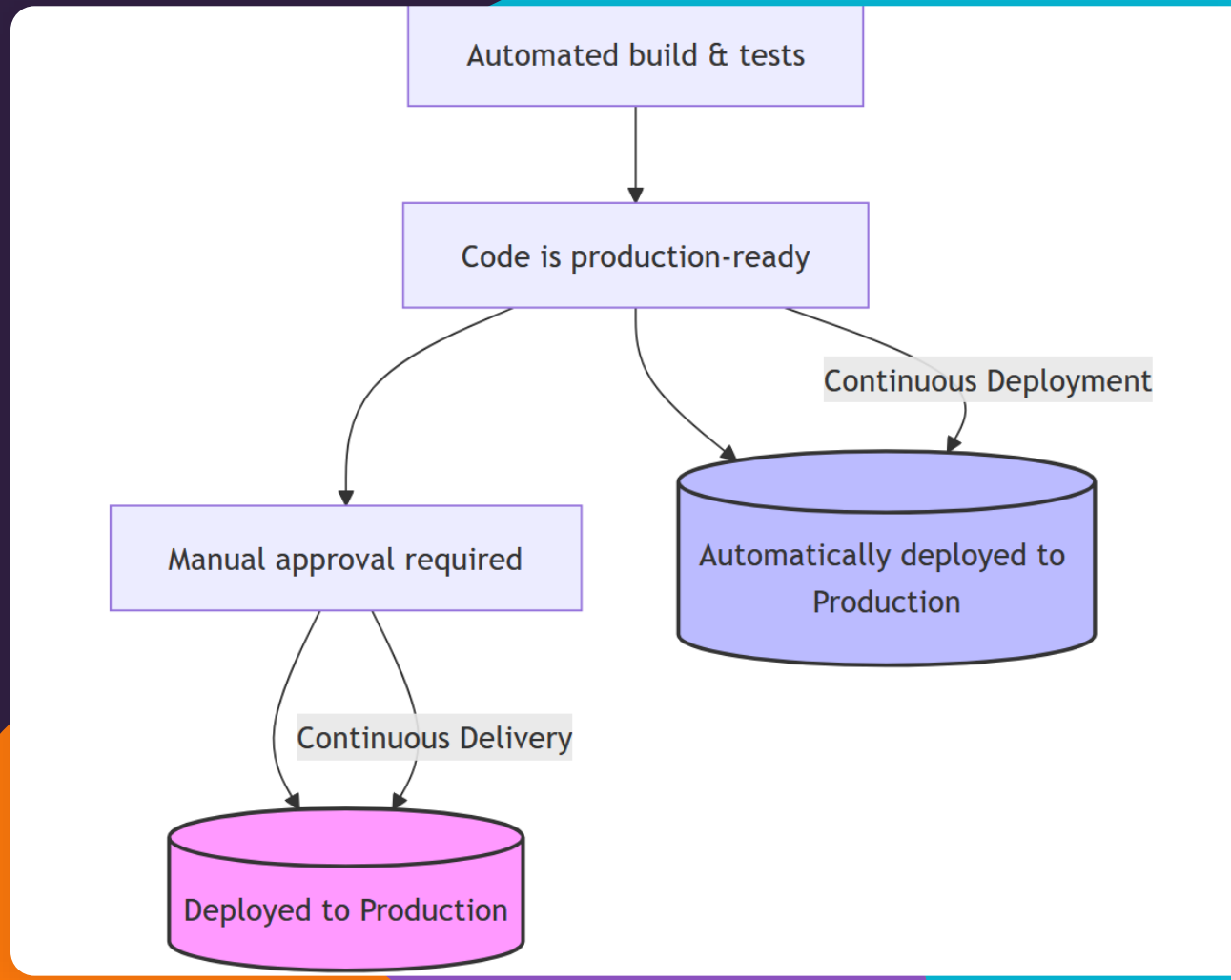
What is CD?

Delivery

All code that is merged into the main branch is ready to be deployed.

Deployment

All code that is merged into the main branch is deployed.



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CI/CD Tooling & Platforms

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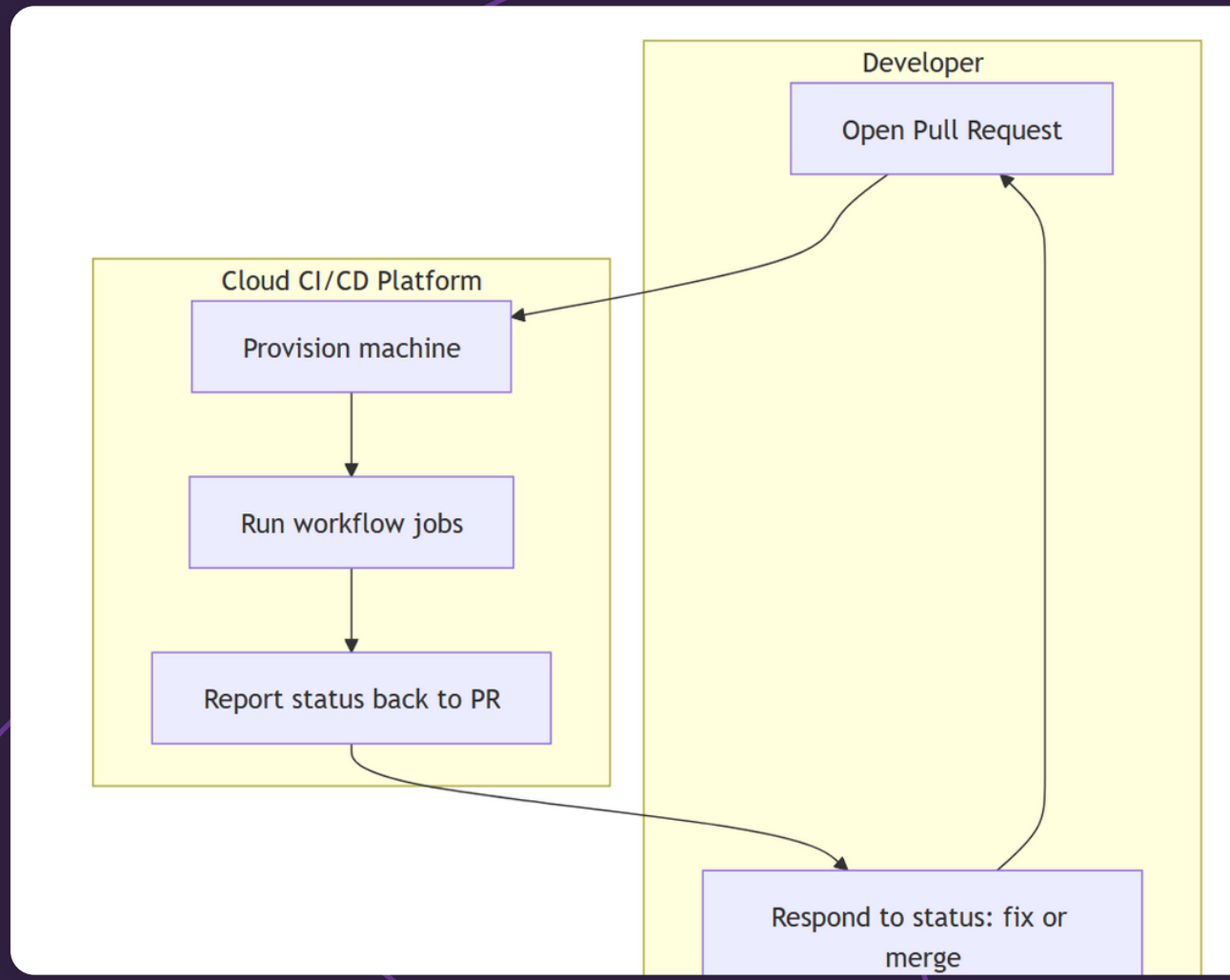
Cloud-based CI/CD platforms

- GitHub Actions
- GitLab CI/CD
- Jenkins
- JetBrains TeamCity
- CircleCI
- TravisCI
- Octopus Deploy



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Deployment Environments

Multi-Environment Deployments

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Development

- A first pass environment for Engineers to test and validate new changes

Staging/Pre-production/Test

- A production-like environment where internal users and testers can validate changes

Production

- Where we make our money! 💸 (deliver value to customers)

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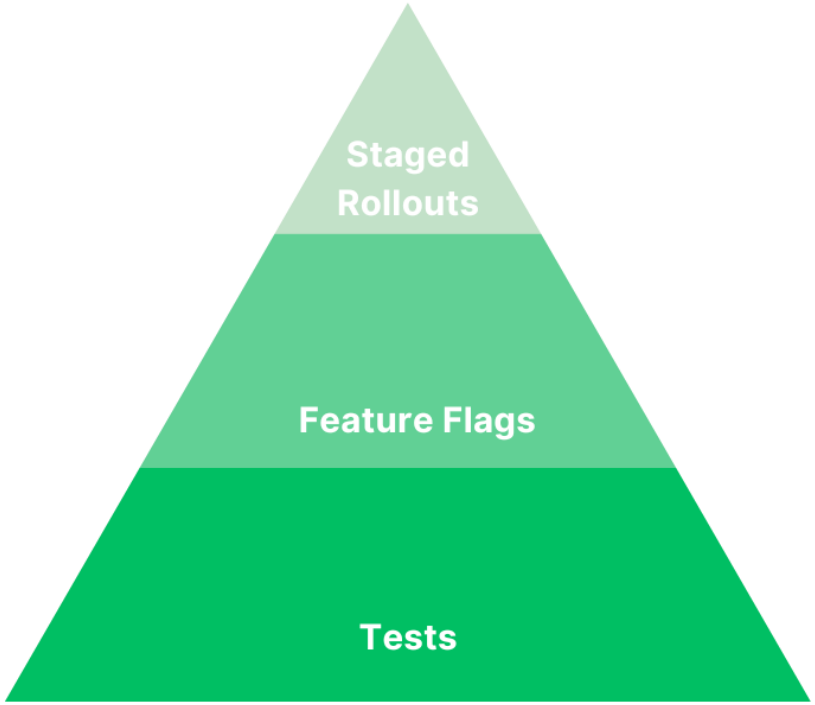
Being Extra Cautious

- ✓ For continuous delivery to work you need a good foundation of tests
- ✓ Feature flags allow us to toggle features at **runtime**
- ✓ Staged/Canary rollouts allow us to release to a **subset** of our users



CI/CD at Phocas

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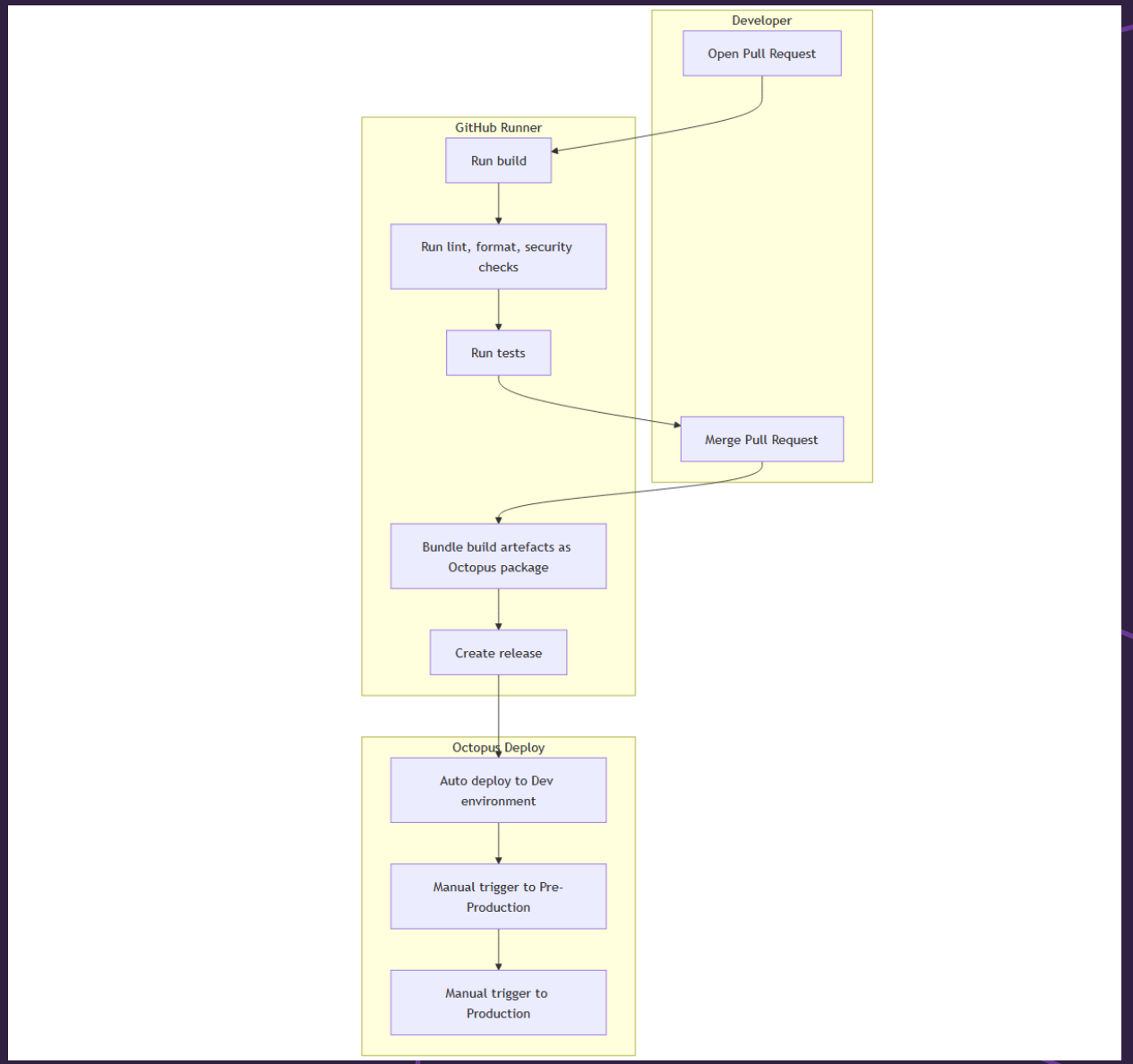

CI/CD Quiz - 1

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Why would a company choose continuous delivery over deployment?

A Continuous deployment only works if you're using a cloud-based CI/CD platform

B Continuous delivery ensures bugs will never reach production, while continuous deployment cannot

C Continuous delivery allows manual approval before production, giving more control over releases

D Continuous delivery is only possible if the company hosts its own servers rather than using the cloud

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CI/CD Quiz - 2

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Which factor has the greatest impact on the success of your CI/CD pipelines

A Picking the right cloud platform

B Running CI/CD jobs in parallel whenever possible

C Using a compiled programming language over an interpreted one

D Having reliable and comprehensive tests

CI/CD Quiz - 2

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Infrastructure as Code (IaC)

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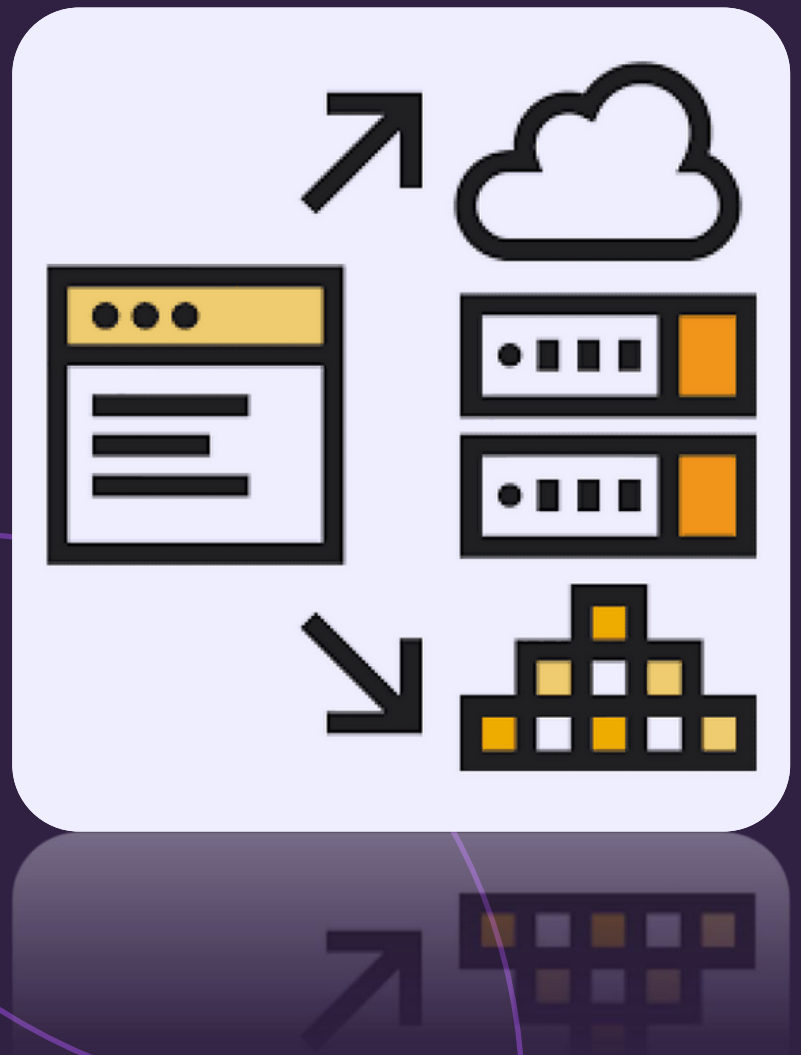
What is IaC?

- IaC is the practice of managing infrastructure (servers, networks, cloud resources) using machine-readable configuration files.

- It treats infrastructure the same way we treat application code — versioned, tested, and deployed automatically.

“Think of it as turning a manual setup into repeatable scripts.”



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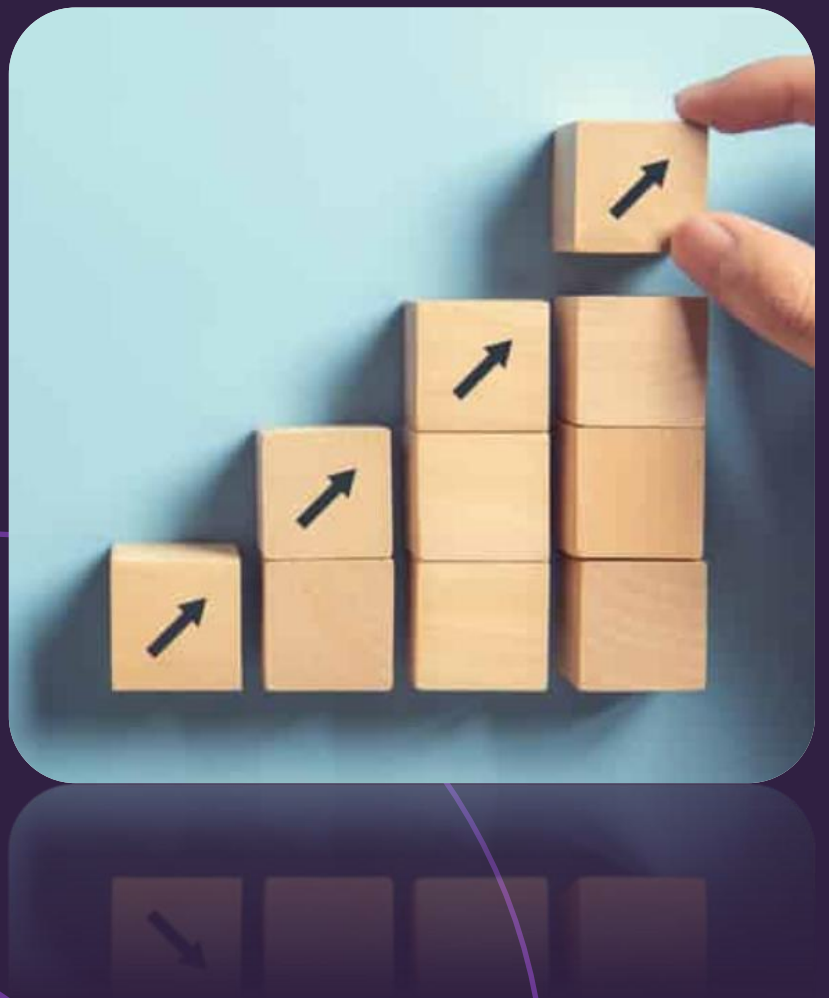
Why It Matters

- **Consistency -** No more “it works on my machine” — environments are identical across dev, test, and prod.
- **Speed -** Infrastructure can be spun up or torn down in minutes.
- **Collaboration -** Dev and Ops teams work from the same source of truth.
- **Scalability -** Easily replicate environments for testing, scaling, or disaster recovery.



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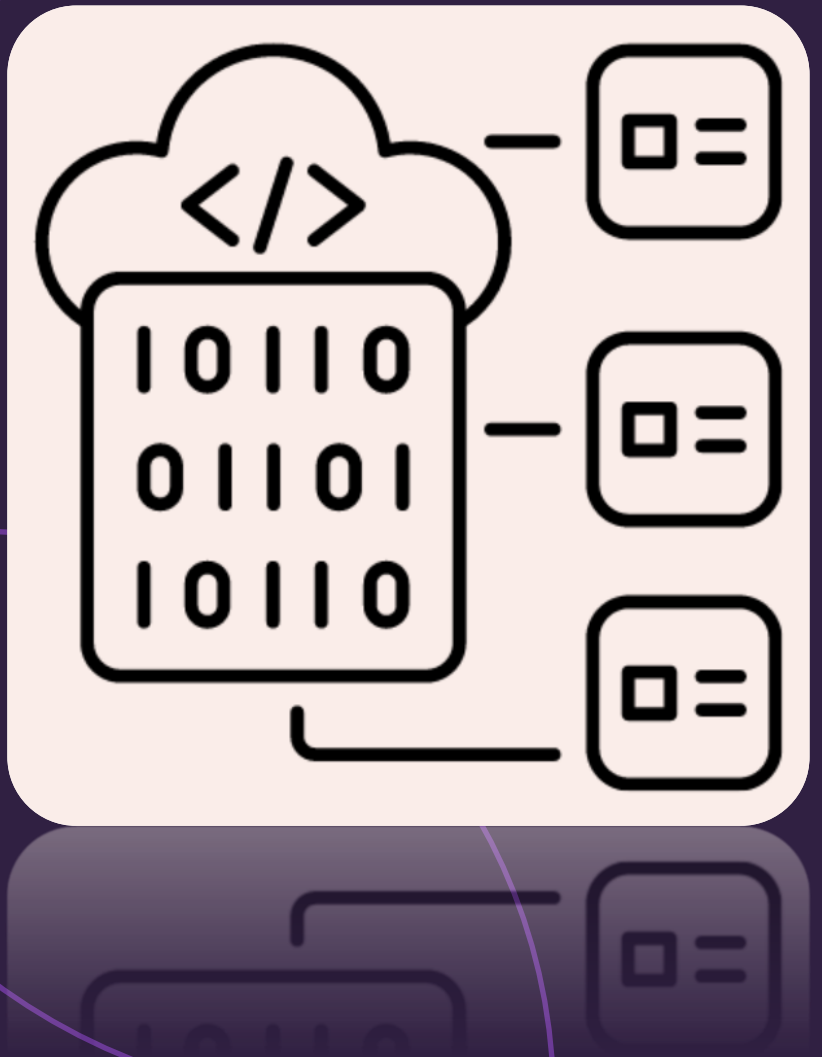
Popular Tools

- **Terraform -** Declarative, cloud-agnostic, widely adopted.
- **Pulumi -** Uses real programming languages (TypeScript, Python, etc.).
- **Ansible -** Great for configuration management and provisioning.
- **CloudFormation -** AWS-native IaC tool for managing resources.

“Each tool has its strengths — choose based on your stack and workflow.”



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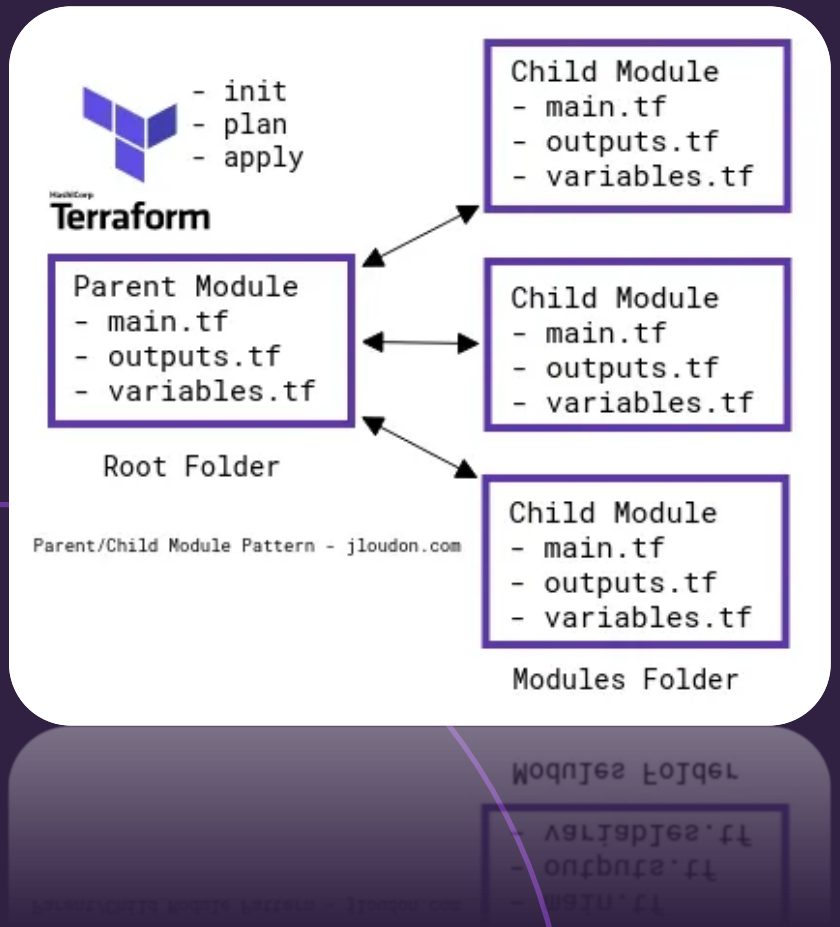
Best Practices

- **Version Control Everything** - Store IaC files in Git for traceability and rollback.
- **Modular Design** - Break infrastructure into reusable components (e.g., VPC modules).
- **Automated Validation** - Use tools like terraform validate or ansible-lint in CI pipelines.
- **Pipeline-Driven Deployment** - Apply changes via CI/CD, not manually.
- **Tag Resources** - Add metadata for cost tracking, ownership, and auditing.



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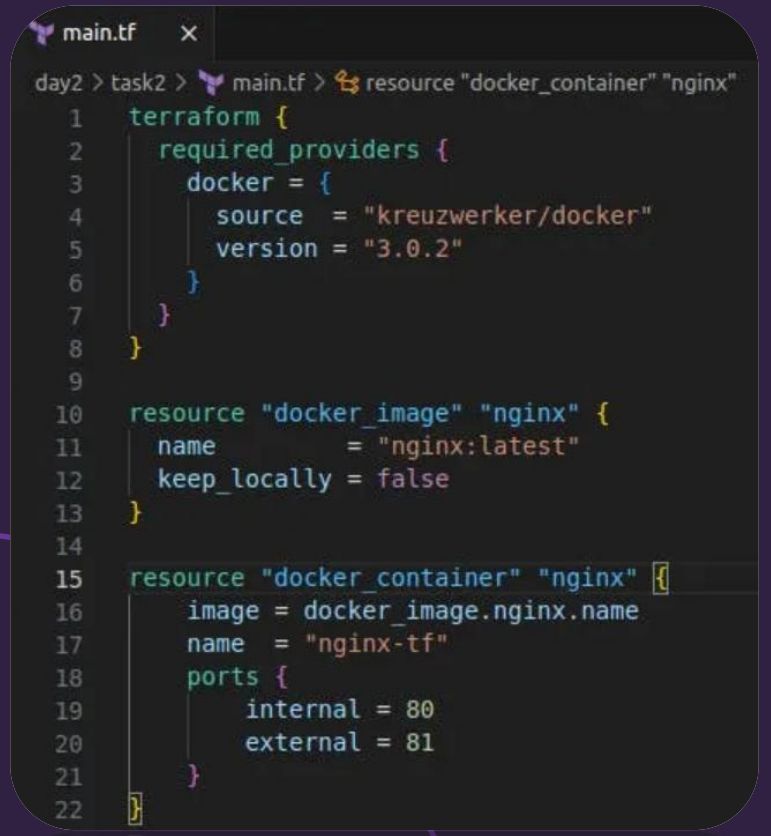
What Does IaC Look Like At Phocas?

- **GitHub** – Source Control, Code Validation & Triggering Deployment.
- **Terraform** – Provisions infrastructure and tracks changes over time.
- **Terragrunt** – Wraps Terraform, simplifying complex Terraform configurations, reduces duplication across environments, and makes multi-environment setups (dev, staging, prod) easier to manage.
- **Atlantis** – Enables Terraform automation via pull requests — bringing Terraform into our CI/CD pipeline.



IaC Quiz - 1

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What is the main benefit of using Infrastructure as Code?

A It eliminates the need for cloud providers

B It enables consistent, repeatable infrastructure deployments

C It allows infrastructure to be managed manually

D It improves application performance

IaC Quiz - 1

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IaC Quiz - 2

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Which of the following best describes a key difference between Terraform and AWS CloudFormation?

A Terraform is limited to AWS, while CloudFormation supports multiple cloud providers

B CloudFormation uses a declarative language, while Terraform uses imperative scripts

C Terraform supports multiple cloud providers, while CloudFormation is AWS-specific

D CloudFormation stores state locally, while Terraform stores state in AWS S3 by default

IaC Quiz - 2

Phocas.

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Containerisation

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What is Containerisation?

- Containerisation is a method of packaging an application along with its dependencies, libraries, and configuration into a single unit.
- Containers run consistently across environments—whether it’s on your laptop, a test server, or production in the cloud.
- While there are several container runtimes available today, Docker has become the de facto standard.

"Think of a container like a shipping container—it doesn't matter what's inside, it can be moved and deployed anywhere reliably."

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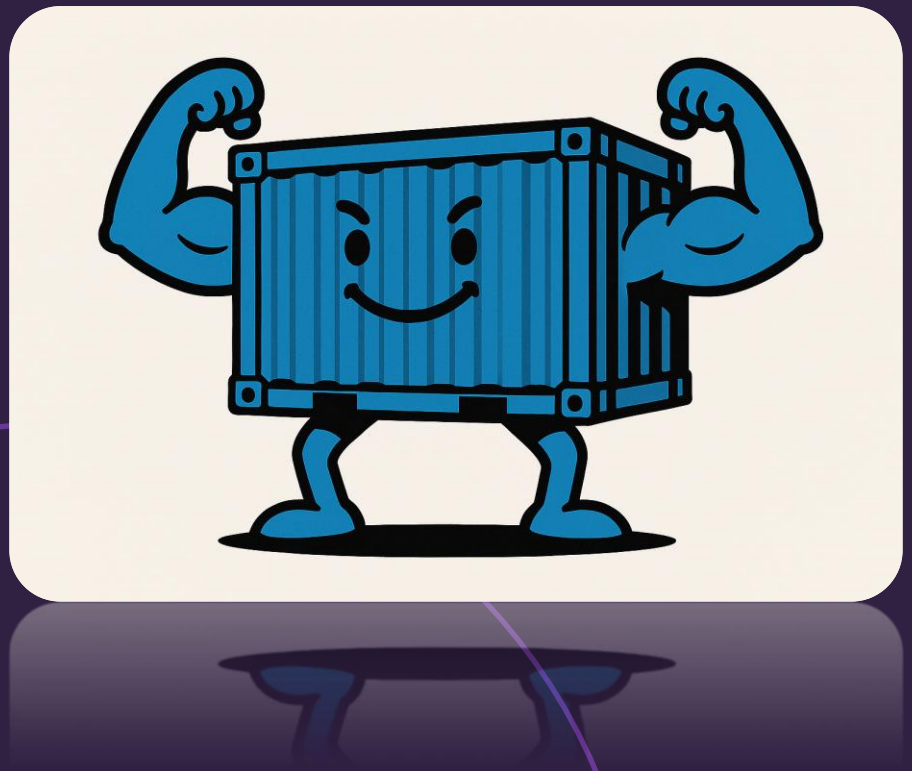
Why Use Containers?

- **Portability**: Containers run the same regardless of the host system.
- **Speed**: Faster startup and deployment compared to traditional VMs.
- **Efficiency**: Lightweight and share the host OS kernel, reducing overhead.
- **Isolation**: Each container runs independently, reducing risk of conflicts.

"A team can develop a Node.js app locally, test it in staging, and deploy it to production without worrying about environment differences."



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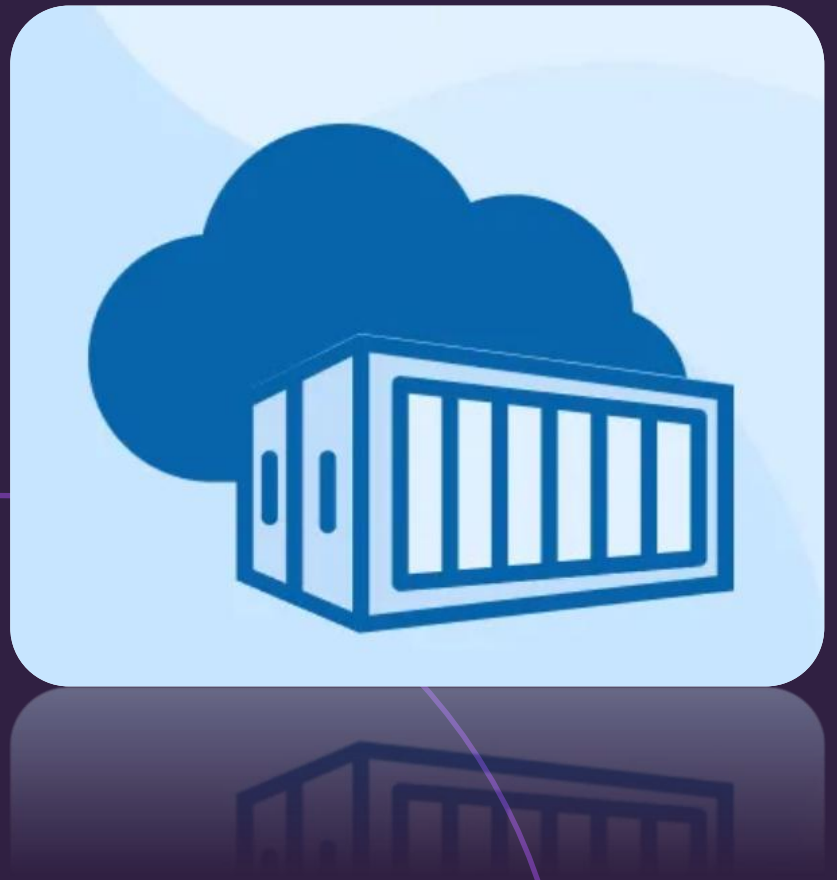
Common Use Cases

- **Microservices**: Each service runs in its own container.
- **CI/CD Pipelines**: Containers simplify testing and deployment.
- **Cloud-native apps**: Designed to scale and run in distributed environments.
- **Dev/Test environments**: Quickly spin up isolated environments.

"Netflix uses containers to deploy thousands of microservices across its infrastructure."



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Challenges and Limitations

- **Persistent storage**: Managing stateful data across container restarts can be tricky.
- **Security**: Containers share the host kernel, so isolation isn't as strong as VMs.
- **Complexity**: Orchestration (e.g., Kubernetes) adds a learning curve.
- **Not ideal for legacy apps**: Older systems may rely on host-specific configurations.

"Containers are powerful, but not a one-size-fits-all solution. Evaluate based on your app's needs."

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Containers vs Virtual Machines

Feature	Container	Virtual Machine
Startup Time	Seconds	Minutes
Resource Usage	Lightweight	Heavy
Isolation	Process-level	Full OS-level
Portability	High	Moderate

"Containers are ideal for lightweight, scalable workloads. VMs are better for full isolation and legacy systems."

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Orchestration

- Tools like **Kubernetes**, **Docker Swarm**, and **OpenShift** help manage containers at scale.

- They handle scheduling, scaling, networking, and health checks.

"Without orchestration, managing hundreds of containers manually would be a nightmare."

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How Do We Use Containerisation At Phocas?

- Docker for local development and testing.
- CI/CD Workflows in GitHub.
- Amazon ECS (Elastic Container Service) for our long running services.
- Amazon EKS (Elastic Kubernetes Service) for hosting Users, Permissions, Identity, and Access Management services.

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Key Takeaways

- Containerisation is a tool—not a silver bullet.
- It requires thoughtful adoption based on application needs and team maturity.

"Use containers where they shine—portability, speed, and scalability—but don't force them where they don't fit."

Containerisation Quiz - 1

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Your team is building a real-time trading platform with strict latency requirements.
What is a potential drawback of using containers?

A Containers are not compatible with high-performance computing environments

B Containers cannot be deployed on-premises

C Containers require a GUI to operate

D Containers introduce slight overhead and unpredictable latency due to shared kernel resources

Containerisation Quiz - 1

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Containerisation Quiz - 2

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What is a key difference between containers and virtual machines?

A Containers include a full operating system, while VMs do not

B Containers are heavier and slower to start than VMs

C Containers share the host OS kernel, while VMs run separate OS instances

D Containers require more memory than VMs

Containerisation Quiz - 2

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Observability

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What is Observability?

- Observability is the ability to understand the internal state of a system based on the data it produces — such as logs, metrics, and traces — without needing to modify or directly inspect the system itself.

- Monitoring tells you *what* happened; observability helps you understand *why*.

- It helps us understand *why* things break, not just *that* they broke.

- Essential for debugging modern, distributed systems.

“Observability is how well you can understand a system from the outside, without having to ship new code to do so.”
— *Charity Majors, CTO of Honeycomb*

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Observability vs Monitoring

Observability	Monitoring
Explores Unknowns	Detects Known Issues
Ad-hoc Investigation	Predefined Alerts
Dynamic Querying	Static Dashboards

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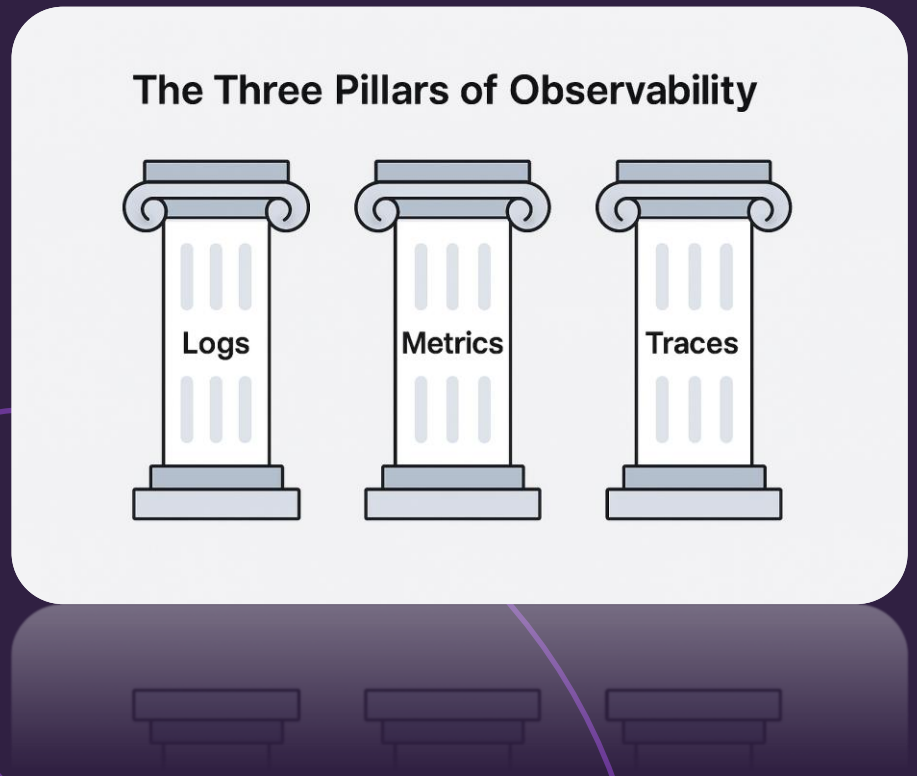
The Three Pillars

- **Logs** – What happened?
- **Metrics** – How is it performing?
- **Traces** – Where did it go wrong?

Together, they help you understand system behavior.



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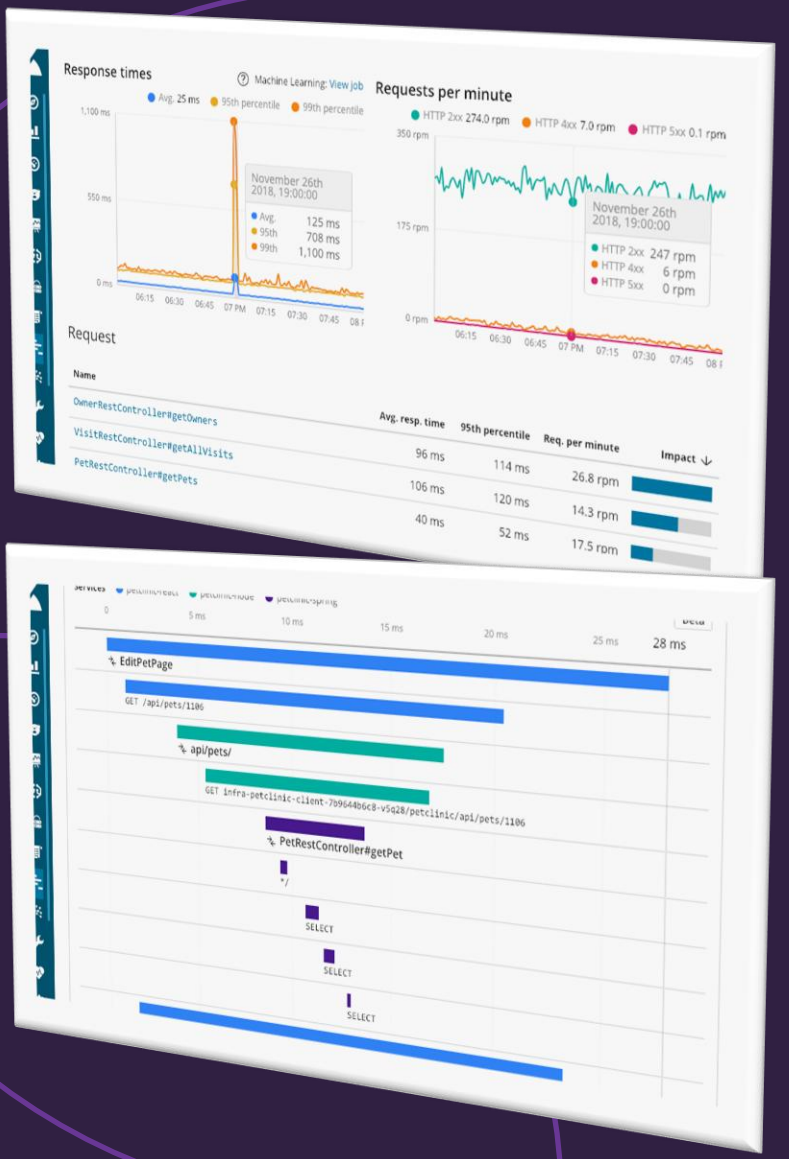
Tooling Examples

- **Metrics -** Prometheus, Grafana
- **Logs -** Elastic (ELK - Elasticsearch, Logstash, and Kibana) Stack, Loki
- **Traces -** Jaeger, OpenTelemetry
- **Application Performance Monitoring (APM) -** AppDynamics, Dynatrace, New Relic
- **All-in-One -** Datadog, Honeycomb



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What Does Observability Look Like at Phocas?

- **Metrics -** AWS CloudWatch, Elastic
- **Logs -** AWS CloudWatch, Elastic
- **Traces -** OpenTelemetry, Elastic
- APM - Elastic, Raygun

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Best Practices

- **Instrument early** – Add telemetry during development.
- **Use structured logs** – Log in key-value pairs (e.g., JSON), include request IDs, user IDs, and timestamps.
- **Correlate data with trace IDs** – Link logs, metrics, and traces using unique identifiers (e.g., trace IDs), connect the dots.
- **Automate alerts** – Focus on meaningful thresholds and anomalies.
- **Focus on actionable insights** – Build dashboards that answer real questions, prioritising user impact, not just system health.
- **Foster a Culture of Curiosity** – Encourage teams to explore telemetry data, not just react to alerts. Use observability as a learning tool during postmortems and retrospectives.

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Looking Ahead

- **OpenTelemetry adoption** – Open Source standard, unifies observability tooling, easier to instrument code and is platform agnostic.
- **AI-powered insights** – Using machine learning to detect anomalies, predict failures, and suggest root causes, helps move teams from being reactive to proactive.
- **Observability-as-Code** – Defining dashboards, alerts, and telemetry configurations in version-controlled code, bringing observability into CI/CD pipelines, ensuring consistency across environments, and makes changes auditable and repeatable.
- **Shift-left observability** – Embedding observability earlier in the development lifecycle — during coding, testing, and staging. It helps catch performance and reliability issues before they reach production, improving release confidence and reducing firefighting.

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Key Takeaways

- Observability is a mindset
- It enables faster, smarter debugging
- It’s critical for modern DevOps success

Observability Quiz - 1

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Which of the following is not one of the three pillars of observability?

A Logs

B Alerts

C Metrics

D Traces

Observability Quiz - 1

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How does observability differ from traditional monitoring?

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B Monitoring is proactive, observability is reactive

C Observability helps explore unknown issues, monitoring detects known ones

D They are exactly the same

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3

Take Home Example Demonstration

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Q & A

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GitHub URL:

https://github.com/GiftMk/key-value-converter

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Thank you