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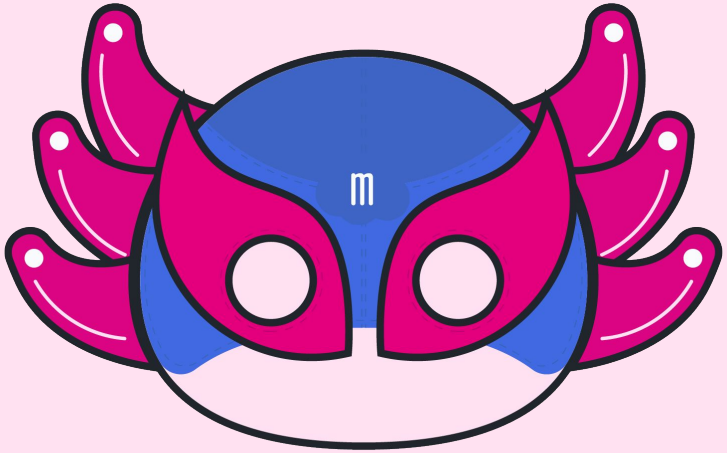
Charting New Frontiers: The Evolution of Observability in Cloud Environments

Omar Montero



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Observability Is No Longer Optional

- Evolution from monoliths to microservices, cloud-native & containerized deployments
- These architectures increase scalability & resilience, but also complexity
- Observability provides deep insights to:

✅ Detect issues proactively

✅ Diagnose & resolve faster

✅ Optimize performance

✅ Enhance security & compliance

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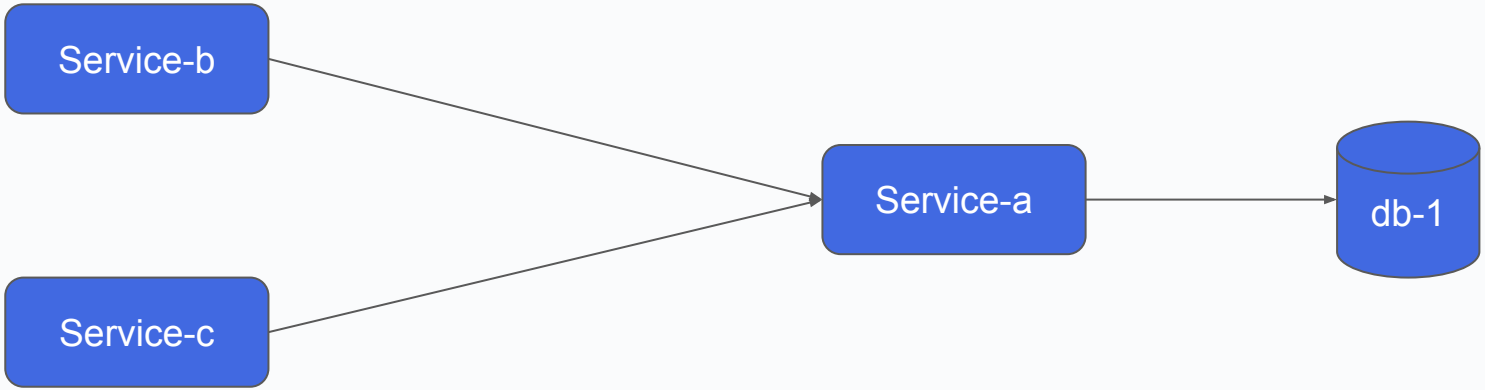
What Is Observability?

👉 “The ability to understand a system’s internal state by analyzing external outputs like logs, metrics, and traces.”

- Logging
- Metrics
- Tracing
- Visualization

Service-a can’t write to db-1



Logs - there is an error, can’t write to db-1
Metrics - high CPU, the “technical” why
Trace - the context, the “path” within the system

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Best Practices for Implementing Observability

✅ **Unified Observability Platform**

- Correlate logs, metrics, and traces

✅ **Automated Alerts & Anomaly Detection**

- Leverage AI/ML for smarter alerts

✅ **Culture of Observability**

- Train teams to debug distributed systems

✅ **Scalability & Compliance**

- Build scalable observability pipelines
- Define log retention policies aligned with compliance

Building an Effective Observability Stack: InfraCloud's Approach

✅ **Performance Monitoring**

- Intuitive dashboards & real-time alerts
- Rapid issue identification & resolution
- Proactive troubleshooting = **reduced downtime**

✅ **Infrastructure Monitoring**

- Visualizations to predict potential issues
- Alarms & real-time notifications
- **Cloud & hybrid environments** covered

✅ **Logging Infrastructure**

- Centralized log management
- Long-term storage & retention
- Log visualization & **real-time event alerts**

✅ **Distributed Tracing**

- Trace the journey of a transaction
- Pinpoint bottlenecks
- Optimize performance & **reduce latency**

🔧 Best Practices for DevOps Observability

1️⃣ **Implement End-to-End Monitoring**

- Visibility from **code commit** → **production** → **end-user**

2️⃣ **Use AI & Automation**

- AI-driven anomaly detection & **auto-remediation**

3️⃣ **Centralize Logs**

- Aggregate logs for correlation & faster RCA

4️⃣ **Adopt Distributed Tracing**

- Trace requests across services for **latency analysis**

5️⃣ **Enable Real-time Alerting**

- Proactive notifications before user impact

6️⃣ **Integrate Observability in CI/CD Pipelines**

- Shift-left observability in the **SDLC**

7️⃣ **Ensure Security Observability**

- Detect vulnerabilities & threats in real time

8️⃣ **Focus on User Experience Monitoring**

- Ensure **performance** & **reliability** from the user's perspective

9️⃣ **Continuous Learning & Optimization**

- Regularly review telemetry data & optimize systems

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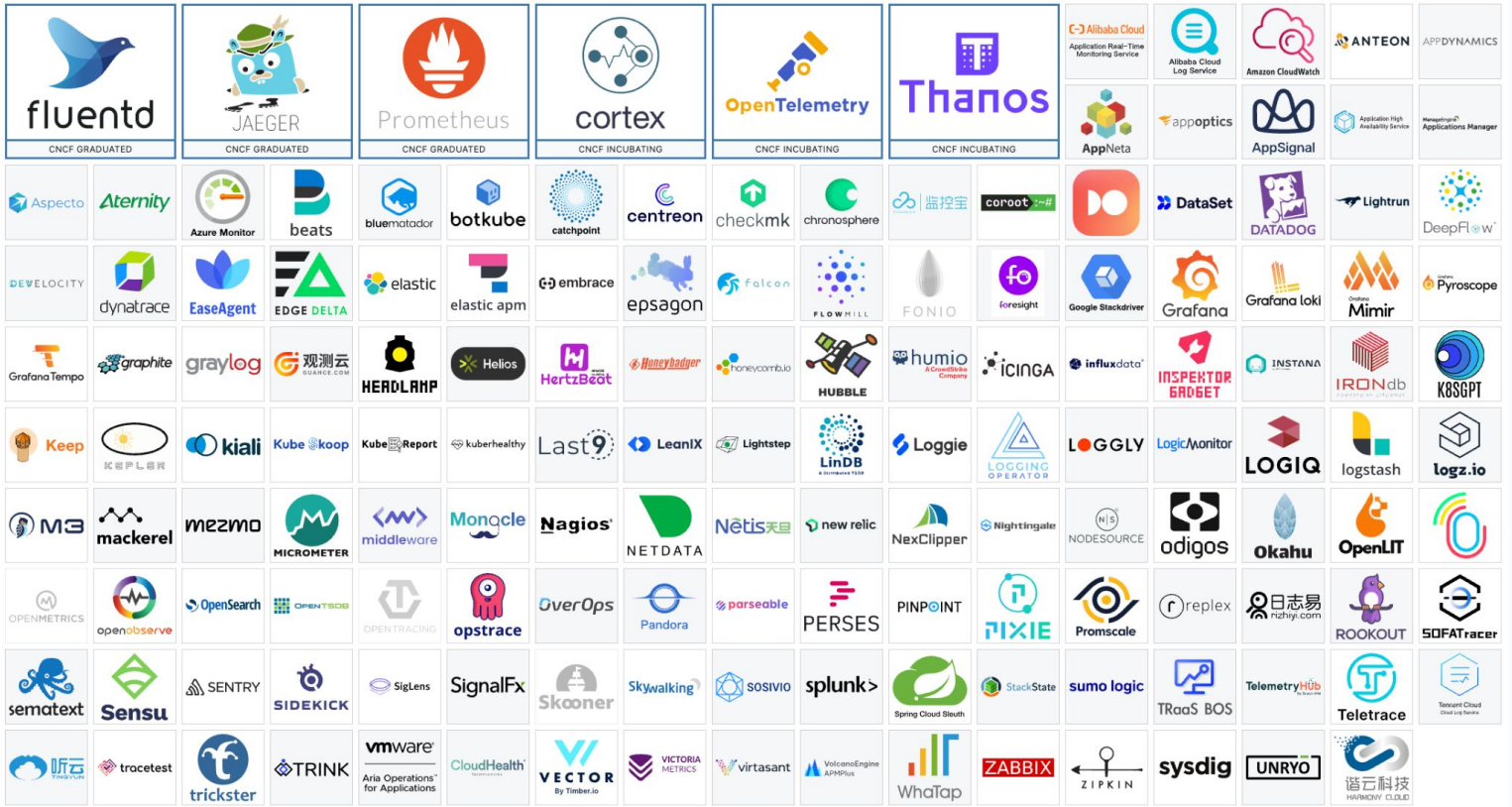
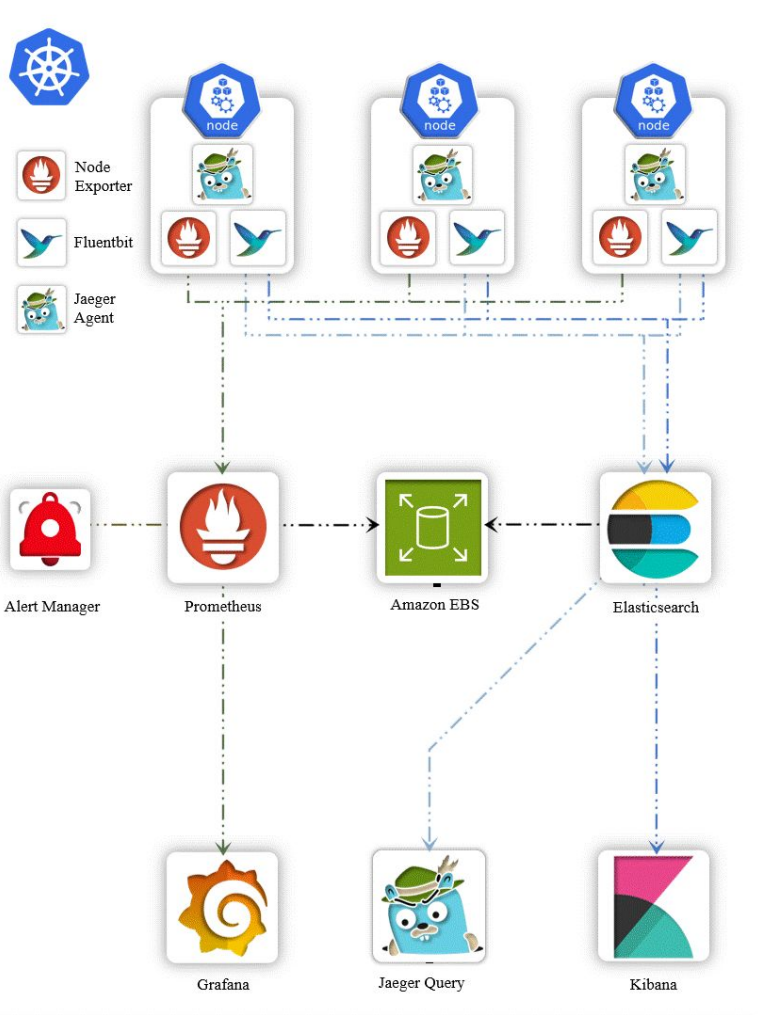
CNCF Projects




node
node
node
Node Exporter
Fluentbit
Jaeger Agent
Alert Manager
Prometheus
Amazon EBS
Elasticsearch
Grafana
Jaeger Query
Kibana

Key Benefits of Observability for Distributed Systems

🔧 Managing Microservices Complexity

- Track dependencies & API interactions
- Analyze data flows in dynamic systems

⚙️ Performance Optimization

- Identify latency bottlenecks
- Optimize resource usage & infrastructure costs
- Enable auto-scaling through traffic analysis

⏱️ Faster Detection & Resolution

- Proactive alerts & anomaly detection
- Reduced MTTD & MTTR
- Simplify Root Cause Analysis (RCA)

Security & Compliance Benefits

- 🔒 Detect unusual access patterns
- 🔒 Ensure **GDPR**, **HIPAA**, **SOC 2** compliance
- 🔒 Maintain audit logs for forensic investigations

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What Is Observability as Code?

Observability as Code shifts observability left by automating the setup and management of observability tools using code. It simplifies tasks like monitoring alerts, and dashboard creation to ensure consistent and efficient insights. This approach helps configure and deploy the observability artifacts alongside your cloud resources, extending the principles of Infrastructure as Code (IaC).

Observability as Code

```
ource "grafana_dashboard" "metrics" {
onfig_json = jsonencode({
 title   = "as-code dashboard"
 uid     = "ascode"
})
```

```
- name: dashboard as code
  grafana.grafana.dashboard:
    dashboard: {
      "title": "as-code dashboard",
      "uid": "ascode"
    }
    stack_slug: "{{ stack_slug }}"
    grafana_api_key: "{{ grafana_api_key }}"
    state: present
```

```
AWSTemplateFormatVersion : '2010-09-09'
Transform:
  - AWS::Serverless-2016-10-31
  - Name: DatadogServerless
    Parameters:
      stackName: !Ref "AWS::StackName"
      apiKey: !Ref DDApiKey
      nodeLayerVersion: 121
      extensionLayerVersion: 73
      site: !Ref DDSite
```

```
const datadogConfiguration = new DatadogLambda(this, "Datadog", {
  nodeLayerVersion: 121,
  extensionLayerVersion: 73,
  site: process.env.DD_SITE ?? "datadoghq.com",
  apiKeySecret: ddApiKey,
});

datadogConfiguration.addLambdaFunctions([generatePricingFunction]);
```

```
module "aws_lambda_function" {
  source  = "DataDog/lambda-datadog/aws"
  version = "2.0.0"

  filename                 = var.zip_file
  function_name            = "tf-node-${var.function_name}-${var.env}"
  role                     = aws_iam_role.lambda_function_role.arn
  handler                  = var.lambda_handler
  runtime                  = "nodejs22.x"
  memory_size              = var.memory_size
  logging_config_log_group = aws_cloudwatch_log_group.lambda_log_group.name
  source_code_hash         = filebase64sha256(var.zip_file)
  timeout                  = var.function_timeout

  datadog_extension_layer_version = 73
  datadog_node_layer_version = 121
}
```

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🧠 The Future: AI-Driven & Predictive Observability

- **AI + Predictive Analytics** → Proactively prevent outages
- **GenAI + ML** in observability is about minimizing **TOIL** + need for deep domain knowledge, enabling human to understand complex system more efficiently and effectively
- **Automated Root Cause Analysis (RCA)**
- **Observability + Cybersecurity convergence**
- **Agent-based AI tools** to reduce human intervention


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This page showcases basic LLM integration within a scenes app
Basic LLM Integration
Advanced LLM Integration
Comparison
Previous period
Last 6 hours
Show me 20 servers
Submit Request
20
__server_names
38
36
34
32
30
09:00
09:15
09:30
09:45
10:00
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Backend-ops-01
Backend-ops-02
Backend-ops-03
Backend-ops-04
Frontend-web-01
Frontend-web-02
Frontend-web-03
Frontend-web-04
MySQL-01
MySQL-02
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SAN-01
SAN-02

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This page showcases basic LLM integration within a scenes app

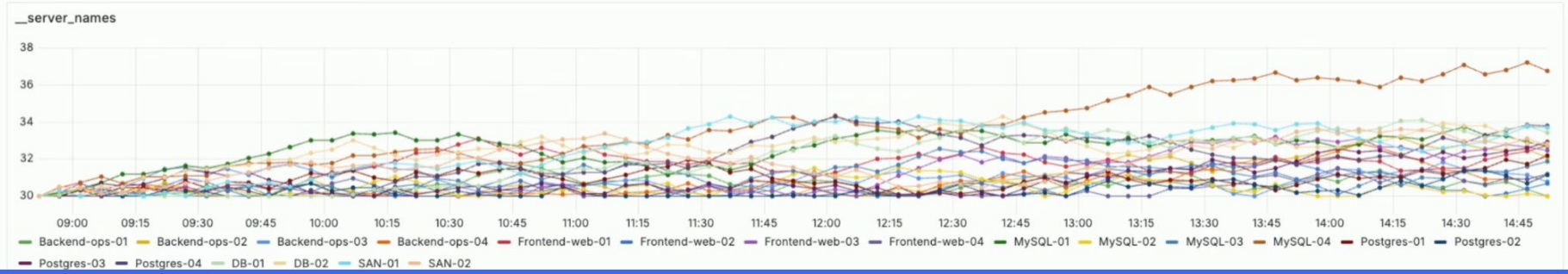
Basic LLM Integration | Advanced LLM Integration

Comparison | Previous period | Last 6 hours

Explain the data being displayed

Submit Request

The data displayed shows the performance metrics of different servers over time. These metrics include values like resource usage, response times, and other operational insights important for maintaining the servers. Understanding this data helps optimize the server infrastructure to ensure its reliability and efficiency.

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Last 6 hours
Compare and contrast this server's data with last week's data
Submit Request
compare
__server_names
60
55
50
45
2024-04-10 11:56:52
MySQL-04 59.3
09:00 09:15 09:30 09:45 10:00 10:15 10:30 10:45 11:00 11:15 11:30 11:45 12:00 12:15 12:30 12:45 13:00 13:15 13:30 13:45 14:00 14:15 14:30 14:45
Backend-ops-01 Backend-ops-02 Backend-ops-03 Backend-ops-04 Frontend-web-01 Frontend-web-02 Frontend-web-03 Frontend-web-04 MySQL-01 MySQL-02 MySQL-03 MySQL-04 Postgres-01 Postgres-02
Postgres-03 Postgres-04 DB-01 DB-02 SAN-01 SAN-02 Backend-ops-01 (comparison) Backend-ops-02 (comparison) Backend-ops-03 (comparison) Backend-ops-04 (comparison) Frontend-web-01 (comparison)
Frontend-web-02 (comparison) Frontend-web-03 (comparison) Frontend-web-04 (comparison) MySQL-01 (comparison) MySQL-02 (comparison) MySQL-03 (comparison) MySQL-04 (comparison) Postgres-01 (comparison)
Postgres-02 (comparison) Postgres-03 (comparison) Postgres-04 (comparison) DB-01 (comparison) DB-02 (comparison) SAN-01 (comparison) SAN-02 (comparison)

Demo: Observability in Action

👩‍💻 Live Demo / Scenario

- EKS cluster with OpenTelemetry → Prometheus → Grafana → Jaeger
- Simulated failure
- Dashboards, Traces, and Logs in action

💡 Demo Takeaways

- How Proactive Observability speeds RCA
- Dashboards, Traces, Alerts, Human-readable insights = Faster fixes

Q & A