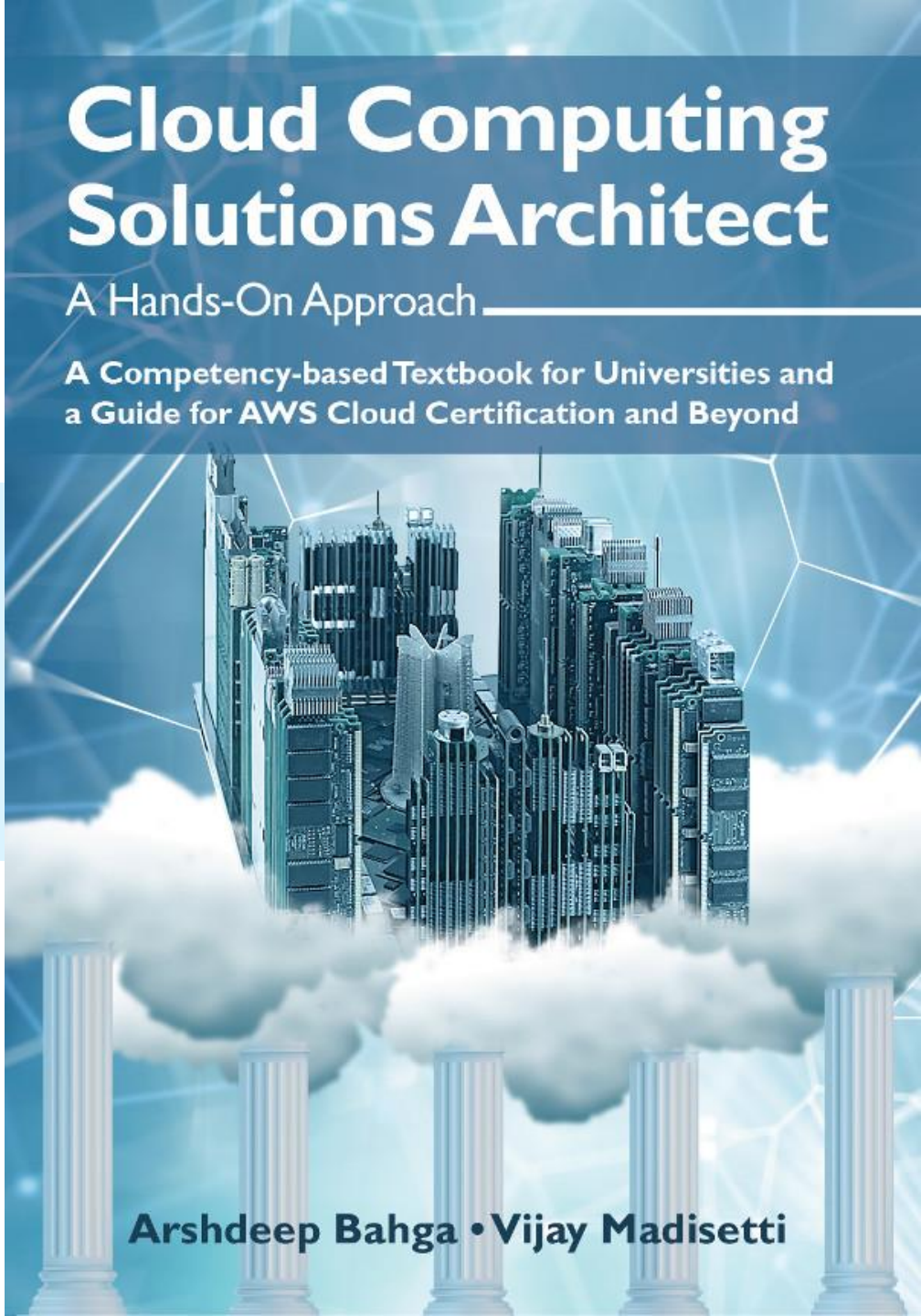
# Chapter 16

## Applying the Operational Excellence Pillar



# Operational Excellence

- The Operational Excellence pillar includes the ability to run and monitor systems to deliver business value and to improve supporting processes and procedures continually.
- Within the Operational Excellence pillar, there are three best practice areas:
  - Prepare
  - Operate
  - Evolve

# Design Principles for Operational Excellence

- Perform operations as code instead of doing them manually to limit human error. The execution of the operations can be automated and triggered in response to events.
- Automate the creation of documentation by using annotation instead of creating documentation by hand, which can get outdated and out of sync.
- Whenever an application needs to be updated, make changes in small increments that can be reversed if they fail.
- As your application's architecture evolves, keep refining the operations procedures accordingly.
- Identify potential points of failures within your application and test various failure scenarios.
- Learn through operational events and failures.

# Best Practice Area: Prepare

- The Prepare best practice area highlights the importance of effective preparation for driving operational excellence.
- For any business or application, you must determine the priorities by evaluating the customer requirements, compliance requirements, threat landscape, and the impact of the tradeoff between competing interests.
- The application must be designed so that it provides the information necessary regarding the internal state (such as logs and metrics).

| Pillar I: Operational Excellence - Best Practice Area: Prepare | |
|---|---|
| **Consideration** | **Best practice** |
| **Determine your priorities** | Evaluate external customer needs |
| | Evaluate internal customer needs |
| | Evaluate compliance requirements |
| | Evaluate threat landscape |
| | Evaluate tradeoffs |
| | Manage benefits and risks |
| **Design your workload so that you can understand its state** | Implement application telemetry |
| | Implement and configure workload telemetry |
| | Implement user activity telemetry |
| | Implement dependency telemetry |
| | Implement transaction traceability |
| **Reduce defects, ease remediation, and improve flow into production** | Use version control |
| | Test and validate changes |
| | Use configuration management systems |
| | Use build and deployment management systems |
| | Perform patch management |
| | Share design standards |
| | Implement practices to improve code quality |
| | Use multiple environments |
| | Make frequent, small, reversible changes |
| | Fully automate integration and deployment |
| **Mitigate deployment risks** | Plan for unsuccessful changes |
| | Test and validate changes |
| | Use deployment management systems |
| | Test using limited deployments |
| | Deploy using parallel environments |
| | Deploy frequent, small, reversible changes |
| | Fully automate integration and deployment |
| | Automate testing and rollback |
| **Know that you are ready to support a workload** | Ensure personnel capability |
| | Ensure consistent review of operational readiness |
| | Use runbooks to perform procedures |
| | Use playbooks to identify issues |
| | Make informed decisions to deploy systems and changes |

# Best Practice Area: Operate

- The Operate best practice area highlights the importance of efficient and effective management of application and operations events to achieve operational excellence.
- To understand the health of your application, you must identify key performance indicators (KPIs) and define application metrics to measure the achievement of KPIs.
- Application metrics must be collected and analyzed, and alerts must be raised when application outcomes are at risk or application anomalies are detected.
- To understand the health of your operations, you must define, capture, and analyze operations metrics and raise alerts when operations outcomes are at risk or operations anomalies are detected.
- The application and operations events must be effectively managed to minimize disruptions.
- Processes for event management, incident management, problem management, and root cause analysis must be put in place.

| Pillar I: Operational Excellence - Best Practice Area: Operate | |
|---|---|
| **Consideration** | **Best practice** |
| **Understand the health of your workload** | Identify key performance indicators |
| | Define workload metrics |
| | Collect and analyze workload metrics |
| | Establish workload metrics baselines |
| | Learn expected patterns of activity for workload |
| | Alert when workload outcomes are at risk |
| | Alert when workload anomalies are detected |
| | Validate the achievement of outcomes and the effectiveness of KPIs and metrics |
| **Understand the health of your operations** | Identify key performance indicators |
| | Define operations metrics |
| | Collect and analyze operations metrics |
| | Establish operations metrics baselines |
| | Learn the expected patterns of activity for operations |
| | Alert when operations outcomes are at risk |
| | Alert when operations anomalies are detected |
| | Validate the achievement of outcomes and the effectiveness of KPIs and metrics |
| **Manage workload and operations events** | Use processes for event, incident, and problem management |
| | Use a process for root cause analysis |
| | Have a process per alert |
| | Prioritize operational events based on business impact |
| | Define escalation paths |
| | Enable push notifications |
| | Communicate status through dashboards |
| | Automate responses to events |

# Best Practice Area: Evolve

- The Evolve best practice area highlights the importance of evolving the effectiveness and efficiency of your operations to sustain operational excellence.
- To evolve operations, various approaches must be adopted, for instance, having a process for continuous improvement, implementing feedback loops, defining drivers for improvement, performing operations metrics reviews, and documenting and sharing lessons learned from the execution of operations activities.

| Pillar I: Operational Excellence - Best Practice Area: Evolve | |
|---|---|
| **Consideration** | **Best practice** |
| **Evolve operations** | Have a process for continuous improvement |
| | Implement feedback loops |
| | Define drivers for improvement |
| | Validate insights |
| | Perform operations metrics reviews |
| | Document and share lessons learned |
| | Allocate time to make improvements |

# Recipe for Operational Excellence Pillar

- The photo gallery application is implemented with the Flask Python web framework.
- The application is deployed on an EC2 instance which serves as the application server.
- The application server runs Nginx.
- This recipe described can be used to collect various system metrics and logs from the application server instance of the photo gallery application.
- For collecting system-level metrics and logs from EC2 instances, the CloudWatch agent is installed on the EC2 instance.
- The metrics collected with the CloudWatch agent are stored and viewed in CloudWatch just as you would view any other CloudWatch metrics.