**Table of Contents**

[*Copyright*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_001.html#copyrightp1g)

[*Brief Table of Contents*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_003.html#btoc)

[*Table of Contents*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_004.html#toc)

[*Foreword*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_005.html#pref01)

[*Preface*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_006.html#pref02)

[*Acknowledgments*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_007.html#pref03)

[*About this book*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_008.html#pref04)

[*About the author*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_009.html#pref05)

[*About the cover illustration*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_010.html#pref06)

[*1. The cloud-native context*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_011.html#part01)

[*Chapter 1. You keep using that word: Defining “cloud-native”*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_012.html#ch01)

[*1.1. Today’s application requirements*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_012.html#ch01lev1sec1)

[*1.1.1. Zero downtime*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_012.html#ch01lev2sec1)

[*1.1.2. Shortened feedback cycles*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_012.html#ch01lev2sec2)

[*1.1.3. Mobile and multidevice support*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_012.html#ch01lev2sec3)

[*1.1.4. Connected devices—also known as the Internet of Things*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_012.html#ch01lev2sec4)

[*1.1.5. Data-driven*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_012.html#ch01lev2sec5)

[*1.2. Introducing cloud-native software*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_012.html#ch01lev1sec2)

[*1.2.1. Defining “cloud-native”*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_012.html#ch01lev2sec6)

[*1.2.2. A mental model for cloud-native software*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_012.html#ch01lev2sec7)

[*1.2.3. Cloud-native software in action*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_012.html#ch01lev2sec8)

[*1.3. Cloud-native and world peace*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_012.html#ch01lev1sec3)

[*1.3.1. Cloud and cloud-native*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_012.html#ch01lev2sec9)

[*1.3.2. What isn’t cloud-native*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_012.html#ch01lev2sec10)

[*1.3.3. Cloud-native plays nice*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_012.html#ch01lev2sec11)

[*Summary*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_012.html#ch01lev1sec4)

[*Chapter 2. Running cloud-native applications in production*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_013.html#ch02)

[*2.1. The obstacles*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_013.html#ch02lev1sec1)

[*2.1.1. Snowflakes*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_013.html#ch02lev2sec1)

[*2.1.2. Risky deployments*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_013.html#ch02lev2sec2)

[*2.1.3. Change is the exception*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_013.html#ch02lev2sec3)

[*2.1.4. Production instability*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_013.html#ch02lev2sec4)

[*2.2. The enablers*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_013.html#ch02lev1sec2)

[*2.2.1. Continuous delivery*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_013.html#ch02lev2sec5)

[*2.2.2. Repeatability*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_013.html#ch02lev2sec6)

[*2.2.3. Safe deployments*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_013.html#ch02lev2sec7)

[*2.2.4. Change is the rule*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_013.html#ch02lev2sec8)

[*Summary*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_013.html#ch02lev1sec3)

[*Chapter 3. The platform for cloud-native software*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_014.html#ch03)

[*3.1. The cloud(-native) platform evolution*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_014.html#ch03lev1sec1)

[*3.1.1. It started with the cloud*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_014.html#ch03lev2sec1)

[*3.1.2. Cloud-native dial tone*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_014.html#ch03lev2sec2)

[*3.2. Core tenets of the cloud-native platform*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_014.html#ch03lev1sec2)

[*3.2.1. First, let’s talk about containers*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_014.html#ch03lev2sec3)

[*3.2.2. Support for “constantly changing”*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_014.html#ch03lev2sec4)

[*3.2.3. Support for “highly distributed”*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_014.html#ch03lev2sec5)

[*3.3. Who does what?*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_014.html#ch03lev1sec3)

[*3.4. More cloud-native platform capabilities*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_014.html#ch03lev1sec4)

[*3.4.1. The platform supports the entire SDLC*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_014.html#ch03lev2sec6)

[*3.4.2. Security, change-control, compliance (the control functions)*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_014.html#ch03lev2sec7)

[*3.4.3. Controlling what goes into the container*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_014.html#ch03lev2sec8)

[*3.4.4. Upgrading and patching vulnerabilities*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_014.html#ch03lev2sec9)

[*3.4.5. Change control*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_014.html#ch03lev2sec10)

[*Summary*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_014.html#ch03lev1sec5)

[*2. Cloud-native patterns*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_015.html#part02)

[*Chapter 4. Event-driven microservices: It’s not just request/response*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_016.html#ch04)

[*4.1. We’re (usually) taught imperative programming*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_016.html#ch04lev1sec1)

[*4.2. Reintroducing event-driven computing*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_016.html#ch04lev1sec2)

[*4.3. My global cookbook*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_016.html#ch04lev1sec3)

[*4.3.1. Request/response*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_016.html#ch04lev2sec1)

[*4.3.2. Event-driven*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_016.html#ch04lev2sec2)

[*4.4. Introducing Command Query Responsibility Segregation*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_016.html#ch04lev1sec4)

[*4.5. Different styles, similar challenges*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_016.html#ch04lev1sec5)

[*Summary*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_016.html#ch04lev1sec6)

[*Chapter 5. App redundancy: Scale-out and statelessness*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_017.html#ch05)

[*5.1. Cloud-native apps have many instances deployed*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_017.html#ch05lev1sec1)

[*5.2. Stateful apps in the cloud*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_017.html#ch05lev1sec2)

[*5.2.1. Decomposing the monolith and binding to the database*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_017.html#ch05lev2sec1)

[*5.2.2. Poorly handling session state*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_017.html#ch05lev2sec2)

[*5.3. HTTP sessions and sticky sessions*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_017.html#ch05lev1sec3)

[*5.4. Stateful services and stateless apps*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_017.html#ch05lev1sec4)

[*5.4.1. Stateful services are special services*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_017.html#ch05lev2sec3)

[*5.4.2. Making apps stateless*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_017.html#ch05lev2sec4)

[*Summary*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_017.html#ch05lev1sec5)

[*Chapter 6. Application configuration: Not just environment variables*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_018.html#ch06)

[*6.1. Why are we even talking about config?*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_018.html#ch06lev1sec1)

[*6.1.1. Dynamic scaling—increasing and decreasing the number of app instances*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_018.html#ch06lev2sec1)

[*6.1.2. Infrastructure changes causing configuration changes*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_018.html#ch06lev2sec2)

[*6.1.3. Updating application configuration with zero downtime*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_018.html#ch06lev2sec3)

[*6.2. The app’s configuration layer*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_018.html#ch06lev1sec2)

[*6.3. Injecting system/environment values*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_018.html#ch06lev1sec3)

[*6.3.1. Let’s see this in action: Using ENV variables for configuration*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_018.html#ch06lev2sec4)

[*6.4. Injecting application configuration*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_018.html#ch06lev1sec4)

[*6.4.1. Introducing the configuration server*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_018.html#ch06lev2sec5)

[*6.4.2. Security adds more requirements*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_018.html#ch06lev2sec6)

[*6.4.3. Let’s see this in action: Application configuration using a config server*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_018.html#ch06lev2sec7)

[*Summary*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_018.html#ch06lev1sec5)

[*Chapter 7. The application lifecycle: Accounting for constant change*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_019.html#ch07)

[*7.1. Having empathy for operations*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_019.html#ch07lev1sec1)

[*7.2. Single-app lifecycle, multiple-instance lifecycles*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_019.html#ch07lev1sec2)

[*7.2.1. Blue/green upgrades*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_019.html#ch07lev2sec1)

[*7.2.2. Rolling upgrades*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_019.html#ch07lev2sec2)

[*7.2.3. Parallel deployments*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_019.html#ch07lev2sec3)

[*7.3. Coordinating across different app lifecycles*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_019.html#ch07lev1sec3)

[*7.4. Let’s see this in action: Credential rotation and app lifecycle*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_019.html#ch07lev1sec4)

[*Setting up*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_019.html#ch07lev2sec4)

[*Building the microservices (optional)*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_019.html#ch07lev2sec5)

[*Running the apps*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_019.html#ch07lev2sec6)

[*7.5. Dealing with ephemeral runtime environments*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_019.html#ch07lev1sec5)

[*7.6. Visibility of app lifecycle state*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_019.html#ch07lev1sec6)

[*7.6.1. Let’s see this in action: Health endpoints and probes*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_019.html#ch07lev2sec7)

[*7.7. Serverless*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_019.html#ch07lev1sec7)

[*Summary*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_019.html#ch07lev1sec8)

[*Chapter 8. Accessing apps: Services, routing, and service discovery*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_020.html#ch08)

[*8.1. The service abstraction*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_020.html#ch08lev1sec1)

[*8.1.1. Service example: Googling*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_020.html#ch08lev2sec1)

[*8.1.2. Service example: Our blog aggregator*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_020.html#ch08lev2sec2)

[*8.2. Dynamic routing*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_020.html#ch08lev1sec2)

[*8.2.1. Server-side load balancing*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_020.html#ch08lev2sec3)

[*8.2.2. Client-side load balancing*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_020.html#ch08lev2sec4)

[*8.2.3. Route freshness*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_020.html#ch08lev2sec5)

[*8.3. Service discovery*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_020.html#ch08lev1sec3)

[*8.3.1. Service discovery on the web*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_020.html#ch08lev2sec6)

[*8.3.2. Service discovery with client-side load balancing*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_020.html#ch08lev2sec7)

[*8.3.3. Service discovery in Kubernetes*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_020.html#ch08lev2sec8)

[*8.3.4. Let’s see this in action: Using service discovery*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_020.html#ch08lev2sec9)

[*Summary*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_020.html#ch08lev1sec4)

[*Chapter 9. Interaction redundancy: Retries and other control loops*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_021.html#ch09)

[*9.1. Request retries*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_021.html#ch09lev1sec1)

[*9.1.1. The basic request retry*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_021.html#ch09lev2sec1)

[*9.1.2. Let’s see this in action: Simple retries*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_021.html#ch09lev2sec2)

[*9.1.3. Retries: what could go wrong?*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_021.html#ch09lev2sec3)

[*9.1.4. Creating a retry storm*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_021.html#ch09lev2sec4)

[*9.1.5. Let’s see this in action: Creating a retry storm*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_021.html#ch09lev2sec5)

[*9.1.6. Avoiding retry storms: Kind clients*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_021.html#ch09lev2sec6)

[*9.1.7. Let’s see this in action: being a kinder client*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_021.html#ch09lev2sec7)

[*9.1.8. When not to retry*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_021.html#ch09lev2sec8)

[*9.2. Fallback logic*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_021.html#ch09lev1sec2)

[*9.2.1. Let’s see this in action: Implementing fallback logic*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_021.html#ch09lev2sec9)

[*9.3. Control loops*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_021.html#ch09lev1sec3)

[*9.3.1. Understanding types of control loops*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_021.html#ch09lev2sec10)

[*9.3.2. Controlling the control loop*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_021.html#ch09lev2sec11)

[*Summary*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_021.html#ch09lev1sec4)

[*Chapter 10. Fronting services: Circuit breakers and API gateways*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_022.html#ch10)

[*10.1. Circuit breakers*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_022.html#ch10lev1sec1)

[*10.1.1. The software circuit breaker*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_022.html#ch10lev2sec1)

[*10.1.2. Implementing a circuit breaker*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_022.html#ch10lev2sec2)

[*10.2. API gateways*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_022.html#ch10lev1sec2)

[*10.2.1. The case for API gateways in cloud-native software*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_022.html#ch10lev2sec3)

[*10.2.2. API gateway topology*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_022.html#ch10lev2sec4)

[*10.3. The service mesh*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_022.html#ch10lev1sec3)

[*10.3.1. The sidecar*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_022.html#ch10lev2sec5)

[*10.3.2. The control plane*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_022.html#ch10lev2sec6)

[*Summary*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_022.html#ch10lev1sec4)

[*Chapter 11. Troubleshooting: Finding the needle in the haystack*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_023.html#ch11)

[*11.1. Application logging*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_023.html#ch11lev1sec1)

[*11.2. Application metrics*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_023.html#ch11lev1sec2)

[*11.2.1. Pulling metrics from cloud-native applications*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_023.html#ch11lev2sec1)

[*11.2.2. Pushing metrics from cloud-native applications*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_023.html#ch11lev2sec2)

[*11.3. Distributed tracing*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_023.html#ch11lev1sec3)

[*Setting up*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_023.html#ch11lev2sec3)

[*Running the application*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_023.html#ch11lev2sec4)

[*11.3.1. Tracer output*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_023.html#ch11lev2sec5)

[*11.3.2. Assembling traces via Zipkin*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_023.html#ch11lev2sec6)

[*11.3.3. Implementation details*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_023.html#ch11lev2sec7)

[*Summary*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_023.html#ch11lev1sec4)

[*Chapter 12. Cloud-native data: Breaking the data monolith*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_024.html#ch12)

[*12.1. Every microservice needs a cache*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_024.html#ch12lev1sec1)

[*12.2. Moving from request/response to event driven*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_024.html#ch12lev1sec2)

[*12.3. The event log*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_024.html#ch12lev1sec3)

[*12.3.1. Let’s see this in action: Implementing event-driven microservices*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_024.html#ch12lev2sec1)

[*12.3.2. What’s new with topics and queues?*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_024.html#ch12lev2sec2)

[*12.3.3. The event payload*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_024.html#ch12lev2sec3)

[*12.3.4. Idempotency*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_024.html#ch12lev2sec4)

[*12.4. Event sourcing*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_024.html#ch12lev1sec4)

[*12.4.1. The journey so far*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_024.html#ch12lev2sec5)

[*12.4.2. The source of truth*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_024.html#ch12lev2sec6)

[*12.4.3. Let’s see this in action: Implementing event sourcing*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_024.html#ch12lev2sec7)

[*12.5. We’re just scratching the surface*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_024.html#ch12lev1sec5)

[*Summary*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_024.html#ch12lev1sec6)

[*Patterns used in cloud-native applications*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_025.html#insidefrontcover)

[*Index*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_026.html#MainIndex)

[*List of Figures*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_027.html#lof)

[*List of Tables*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_028.html#lot)

[*List of Listings*](https://learning.oreilly.com/library/view/cloud-native-patterns/9781617294297/kindle_split_029.html#loe)