Kubernetes Patterns - Chapter 5: Lifecycle Management

Reusable Elements for Designing Cloud Native Applications (Second Edition)

作者: Bilgin Ibryam & Roland Huß

本PPT详细覆盖 Lifecycle Management 模式，帮助 Kubernetes 管理容器生命周期。扩展为20页，深入每个子节。

Chapter 5: Lifecycle Management

章节概述 (1/2)

- Chapter 5: Managed Lifecycle (页51-59)
- 结构: Problem, Solution, SIGTERM, SIGKILL, PostStart, PreStop, Other Controls, Discussion

> *Containers in Kubernetes have a lifecycle managed by the platform...*

关键点:

- 焦点: 容器生命周期管理

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章节概述 (2/2)

- 与 Foundational Patterns 相关 (Part I)
- 目标: 优雅处理启动/关闭事件

> *The Managed Lifecycle pattern describes how applications can and should react...*

关键点:

- 避免数据丢失

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Problem - 生命周期挑战 (1/2)

- 容器生命周期由平台管理: 启动、运行、终止
- 应用需符合以确保平稳操作

> *Applications need to conform to this lifecycle to ensure smooth operation...*

关键点:

- 事件: startup, shutdown, restarts

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Problem - 生命周期挑战 (2/2)

- 问题: 不当处理事件导致数据丢失/服务中断
- 示例: 未保存状态、未关闭连接

> *Improper handling of these lifecycle events can lead to data loss or service interruptions...*

关键点:

- 后果: 数据丢失、服务中断

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Solution - 生命周期管理 (1/2)

- 使用平台提供的生命周期钩子
- 处理信号: SIGTERM, SIGKILL

> *The solution is to use the lifecycle hooks provided by the platform...*

关键点:

- 钩子: PostStart, PreStop

```
spec:
  containers:
  - name: app
    lifecycle:
      postStart:
        exec:
          command: ["/bin/sh", "-c", "echo Hello from PostStart"]
```

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Solution - 概述 (2/2)

- 其他: 终止宽限期、重启策略、探针影响
- 确保 predictable 管理

> *These controls ensure that containers can be managed predictably...*

关键点:

- 与可扩展性对齐

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SIGTERM Signal - 概念

- 终止时首先发送，给清理机会
- 应用处理: 关闭连接、保存状态

> *Kubernetes sends a SIGTERM signal... giving the application a chance...*

关键点:

- Graceful shutdown

```
spec:
  containers:
  - name: app
    lifecycle:
      preStop:
        exec:
          command: ["/bin/sh", "-c", "echo Goodbye from PreStop"]
```

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SIGTERM Signal - 示例

- 示例: 应用捕获 SIGTERM 执行 cleanup
- YAML: terminationGracePeriodSeconds: 30

> *Example of how applications can capture SIGTERM to perform cleanup...*

关键点:

- 默认等待30秒

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SIGKILL Signal - 概念

- SIGTERM 后宽限期超时发送
- 强制终止，无清理

> *If the container does not terminate within... Kubernetes sends a SIGKILL signal...*

关键点:

- Non-graceful shutdown

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SIGKILL Signal - 影响

- 风险: 未完成操作丢失
- 建议: 宽限期内完成关键任务

> *SIGKILL is a forceful termination that does not give the application a chance...*

关键点:

- 配置 .spec.terminationGracePeriodSeconds

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PostStart Hook - 概念

- 容器创建后立即执行
- 用于: 下载配置、设置环境

> *The PostStart hook is executed immediately after a container is created...*

关键点:

- 同步/异步执行

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PostStart Hook - 配置示例

- YAML 示例:

```
spec:
  containers:
  - name: app
    lifecycle:
      postStart:
        exec:
          command: ["/bin/sh", "-c", "echo Hello from PostStart"]
```

> *YAML example showing PostStart hook configuration...*

关键点:

- 在 spec.containers.lifecycle.postStart

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PreStop Hook - 概念

- 终止前调用，SIGTERM 前
- 用于: 刷新日志、关闭连接

> *The PreStop hook is called before a container is terminated...*

关键点:

- 阻塞终止直到完成

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PreStop Hook - 配置示例

- YAML 示例:

```
spec:
  containers:
  - name: app
    lifecycle:
      preStop:
        exec:
          command: ["/bin/sh", "-c", "echo Goodbye from PreStop"]
```

> *YAML example showing PreStop hook configuration...*

关键点:

- 确保清理

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Other Lifecycle Controls - 终止宽限期

- .spec.terminationGracePeriodSeconds: 默认30秒
- 控制 SIGTERM 到 SIGKILL 等待

> *The termination grace period specifies the time in seconds...*

关键点:

- 自定义以匹配应用需求

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Other Lifecycle Controls - 重启策略

- .spec.restartPolicy: Always (默认), OnFailure, Never
- 影响失败 Pod 行为

> *Restart Policy: Defines how Pods should be restarted if they fail...*

关键点:

- Job 使用 Never

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Other Lifecycle Controls - 探针影响

- Liveness/Readiness: 间接影响 (Chapter 4)
- Startup: 延迟其他探针

> *Liveness and Readiness Probes... indirectly influence lifecycle management...*

关键点:

- 全面生命周期

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Discussion - 最佳实践 (1/2)

- 钩子适合 stateful 应用
- 最小化宽限期以避免延迟

> *The use of hooks like PostStart and PreStop is particularly important for stateful applications...*

关键点:

- 测试 graceful shutdown

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Discussion - 最佳实践 (2/2) & 总结

- 讨论: 提升可靠性和可扩展性
- 总结: 关键于云原生设计
- 与题目: 覆盖信号、钩子、策略

> *Managing the lifecycle of containers is crucial for ensuring applications can handle platform events gracefully...*

关键点:

- 参考 k8spatterns.io