CHAPTER 2

第二章

Adopting DevOps in Financial Systems

在金融系统中采用DevOps

Enough of the challenges. Let’s look at the drivers for adopting DevOps in financial systems, and how it can be done effectively.

挑战已经足够多了，让我们看看在金融系统中采用DevOps的驱动因素，以及如何有效地实现它。

# Chapter 2.1 Entering the Cloud

进入云端

One of the major drivers for DevOps in financial enterprises is the adoption of cloud services. Online financial institutions like exchanges or clearinghouses are essentially cloud services providers to the rest of the market. And most order and execution management system vendors are, or are becoming, SaaS providers to trading firms. So it makes sense for them to adopt some of the same ideas and design approaches as cloud providers: Infrastructure as Code; virtualization; rapid, automated system provisioning and deployment.

金融企业中采用DevOps的主要驱动因素之一是云服务的采用。像交易所或票据交换所这样的在线金融机构基本上是通过云服务提供商的方式向市场提供服务。大多数订单和执行管理系统供应商现在或正在成为贸易公司的SaaS供应商。因此，他们采用与云提供商相同的一些想法和设计方法是有意义的：基础设施即代码；虚拟化；快速、自动化的系统供应和部署。

The financial services industry is spending billions of dollars on building private internal clouds and using public cloud SaaS and PaaS (or private/public hybrid) solutions. This trend started in general-purpose backend systems, with HR, CRM, and office services using popular SaaS platforms and services like Microsoft’s Office 360 or Azure. Then it extended to development and testing,

providing on-demand platforms for Agile teams.

金融服务业正在花费数十亿美元建造私有内部云，并使用公共云SaaS和PaaS（或私有/公共混合）解决方案。这一趋势始于通用后端系统，包括使用流行的SaaS平台和服务（如Microsoft的Office 360或Azure）的HR、CRM和Office服务。然后，它扩展到开发和测试， 为敏捷团队提供随需应变的平台。

Now more financial services providers are taking advantage of public cloud platforms and tools like Hadoop for data intelligence and analytics, using cloud storage services for data archival. NASDAQ, for example, uses Amazon’s Redshift platform to run a massive data warehouse for data analytics and surveillance applications, adding several billion records per day.

现在，越来越多的金融服务提供商正在利用公共云平台和诸如Hadoop等工具进行数据智能和分析，并将云存储服务用于数据存档。例如，纳斯达克（Nasdaq）利用亚马逊的Redshift平台运行一个庞大的数据仓库，用于数据分析和监控应用，每天新增数十亿条记录。

Today, even regulators are in the cloud. The UK’s Financial Conduct Authority (FCA) is operating its new regulatory reporting systems on Amazon AWS, and FINRA’s new surveillance platform also runs on Amazon AWS.1 The SEC has moved its SEC.gov website and Edgar company filing system, as well as its MIDAS data analytics platform, to a private/public cloud to save operations and maintenance costs, improve availability, and handle surges in demand (such as the one that happened during Facebook’s IPO).2

如今，甚至连监管者也在云端。英国金融行为管理局（FCA）正在亚马逊AWS上运行其新的监管报告系统，Finra的新监控平台也在亚马逊AWS上运行。SEC已将其sec.gov网站、Edgar公司备案系统以及Midas数据分析平台移至私有/公共云，以节省运营和维护成本，提高可用性和应对需求激增（如Facebook IPO期间发生的情况）。

Cloud adoption has been held back by concerns about security and data privacy, data residency and data protection, and other compliance restrictions, according to a recent survey from the Cloud Security Alliance.3 However, as cloud platform providers continue to raise the level of reliability and transparency of their services, and improve auditing controls over operations, encryption, and ediscovery, and as regulators provide clearer guidance on the use of cloud

services, more and more financial data is making its way into the cloud.

云安全联盟（Cloud Security Alliance）最近的一项调查显示，由于对安全和数据隐私、数据驻留和数据保护以及其他合规性限制的担忧，云应用受到阻碍。然而，随着云平台提供商不断提高其服务的可靠性和透明度，并改进对操作、加密和电子数据展示的审计控制，随着监管机构对云服务的使用提供更清晰的指导，越来越多的金融数据正在进入云。

Cloud infrastructure giants like Amazon, Microsoft, and Google have made massive investments over the past few years in upgrading their data centers and improving their operational security and governance programs, learning with, and from, their customers along the way.

过去几年中，像亚马逊、微软和谷歌这样的云基础设施巨头在升级其数据中心、改进其运营安全和治理计划等方面进行了大量投资，向客户学习并和客户一起成长。

Amazon has worked with government regulatory agencies and industry pioneers including Intuit and Capital One to build advanced operational, security, and compliance capabilities into AWS. Unlike 10 years ago, when Netflix and a few internet startups gambled on moving their operations to the cloud despite major reliability and security risks, financial services organizations are now looking to cloud platforms like AWS to take advantage of its security and compliance strengths, as well as operational scalability.

亚马逊已经与政府监管机构和行业先锋（包括Intuit和Capital One）合作，将先进的运营、安全和合规能力构建到AWS中。与10年前不同的是，当Netflix和一些互联网初创公司冒着重大的可靠性和安全风险冒险将业务转移到云计算领域时，金融服务组织现在正寻求像AWS这样的云平台，以利用其安全性和合规性优势以及运营可扩展性。

This has provided financial technology startups like Monzo in the UK and Nubank in Brazil with a fast, scalable, and cost-effective path to launching new cloud-native services. But it is also clearing the road ahead for enterprises.

这为英国的Monzo和巴西的Nubank等金融技术初创企业提供了一条快速、可扩展且经济高效的新云本机服务发布途径。但这也为企业扫清了前进的道路。

One example: after running a series of experiments and successful production pilots, Capital One is now moving all of its business systems to AWS, and plans to completely shut down its internal data center operations within the next five years. According to Rob Alexander, Capital One’s CIO, they selected AWS because they could see clear advantages from a security and compliance perspective:

举个例子：Capital One在进行了一系列试验和成功的生产试点后，现在正将其所有业务系统转移到AWS，并计划在未来五年内完全关闭其内部数据中心运营。根据Capital One首席信息官Rob Alexander的说法，他们之所以选择AWS，是因为他们可以从安全和合规的角度看到明显的优势：

The financial service industry attracts some of the worst cyber criminals. We work closely with AWS to develop a security model, which we believe enables us to operate more securely in the public cloud than we can in our own data centers.

金融服务业吸引了一些最严重的网络罪犯。我们与AWS密切合作，开发一种安全模型，我们相信这种模型使我们能够在公共云中比在我们自己的数据中心中更安全地运行。

Operating a core financial service in the cloud still requires a lot of work. In the cloud provider’s Shared Responsibility Model, they set up and run secure data centers and networking for you and provide a set of secure platform configuration options and services. But it is still up to you to understand how to use these options and services correctly—and to make sure that your application code is secure.

在云端运行核心金融服务仍然需要大量的工作。在云提供商的共享责任模型中，他们为您设置和运行安全数据中心和网络，并提供一组安全平台配置选项和服务。但是，您仍然需要了解如何正确使用这些选项和服务，并确保应用程序代码是安全的。

# Chapter 2.2 Containers in Continuous Delivery

持续交付中的容器

Containers, and especially Docker—a lightweight and portable way to package and ship applications and to isolate them at runtime—are quickly becoming a standard part of many organizations’ DevOps toolkits. Now that Docker has mostly stabilized its platform ecosystem and APIs and is focusing on addressing security and enterprise management requirements, containers are making their way out of innovation labs and into enterprise development and test environments— and even into production.

容器，尤其是Docker——一种轻量级的、可移植的打包和运输应用程序以及在运行时隔离应用程序的方法，正在迅速成为许多组织的DevOps工具包的标准部分。现在，Docker已经基本上稳定了平台生态系统和API，并专注于解决安全和企业管理需求，容器正在走出创新实验室，进入企业开发和测试环境，甚至进入生产。

Some of the organizations that we’ll look at in this report, such as ING, Intuit, and Capital One, are using Docker to package and ship applications for developers and for testing as part of their build pipelines, and in production pilots.

我们将在本报告中看到的一些组织，如Ing、Intuit和Capital One，正在使用Docker为开发人员打包和发布应用程序，并将其作为构建管道以及生产试点的一部分进行测试。

Others have gone much further. PayPal, which operates one of the world’s largest private clouds, managing hundreds of thousands of virtual machines in data centers across the world, has moved thousands of production payment applications onto Docker in order to reduce its operations footprint and to speed up deployment and rollback. PayPal is also using containers to run older legacy applications on modern OS kernels. The International Securities Exchange runs its low-latency production data centers on CoreOS. And Goldman Sachs is in the process of moving thousands of applications into Docker to simplify operations and reduce costs. It expects to shift 90% of all its production computing workloads into containers.

其他组织走得更远。PayPal运营者世界上最大的私有云之一，管理着世界各地数据中心的数十万台虚拟机，已经将数以千计的生产支付应用程序移到了DOCKER上，以减少其业务占用，加速部署和回滚。PayPal还使用容器在旧OS内核上运行旧的遗留应用程序。国际证券交易所在Coreos上运行其低延迟生产数据中心。高盛正在将数千个应用程序转移到Docker中，以简化操作并降低成本。它预计将把90%的生产计算工作转移到容器中。

# Chapter 2.3 Introducing DevOps: Building on Agile

介绍DevOps：建立在敏捷基础之上

DevOps is a natural next step in organizations where Agile development has been adopted successfully. Development teams who have proven that they can iterate through designs and deliver features quickly, and the business sponsors who are waiting for these features, grow frustrated with delays in getting systems into production. They start looking for ways to simplify and streamline the work of acceptance testing and security and compliance reviews; dependency analysis and packaging; and release management and deployment.

在成功采用敏捷开发的组织中，DevOps是一个自然的下一步。已经证明可以快速迭代设计和交付功能的开发团队，以及等待这些功能的业务发起人，对系统投入生产的延迟感到沮丧。他们开始寻找简化和简化验收测试、安全性和合规性审查、依赖性分析和打包以及发布管理和部署工作的方法。

Agile development has already been proven to reduce software project costs and risks. DevOps aims to solve even more important problems for financial services enterprises: mitigating operational risks and reducing operations support and maintenance costs.

敏捷开发已经被证明可以降低软件项目的成本和风险。DevOps旨在为金融服务企业解决更重要的问题：降低运营风险，降低运营支持和维护成本。

**Capital One: From Agile to DevOps**

**Capital One：从敏捷走向Devops**

The ING story is continuing in a way at Capital One, the largest digital bank in the US, which purchased ING Direct USA in 2012. Until then, Capital One outsourced most of its IT. Today, Capital One is fully committed to Agile and DevOps.

美国最大的数字银行Capital One在2012年收购了美国ING Direct。在此之前，Capital One将大部分业务外包出去。今天，Capital One完全致力于敏捷和开发。

Capital One’s Agile experiment started in late 2011, with just two teams. As more teams were trained in Agile development, as at ING, they found that they were building software quickly, but it was taking too long to get working software into production. Development sprints led to testing and hardening sprints before the code was finally ready to be packaged and handed off to production. This wasn’t Agile; it was “Agilefall.”

Capital One的敏捷实验始于2011年底，只有两个团队。随着越来越多的团队接受了敏捷开发方面的培训，比如在ING，他们发现他们正在快速构建软件，但要将工作软件投入生产还需要很长时间。在代码最终准备好打包并交付生产之前，开发冲刺导致了测试和强化冲刺。这不是敏捷，而是“敏捷瀑布”。

Capital One developers were following the Scaled Agile Framework (SAFe). They leveraged the idea of System Teams in SAFe, creating dedicated DevOps teams in each program to help streamline the handoffs between development and operations. These teams were responsible for setting up and managing the development and test environments, for automating build and deployment processes, and for release management, acting as “air traffic controllers to navigate through the CABs.”

Capital One开发人员正在遵循规模化敏捷框架（SAFE）。他们充分利用了系统团队的思想，在每个项目中创建专门的DevOps团队，以帮助简化开发和运维之间的切换。这些团队负责建立和管理开发和测试环境，自动化构建和部署过程，以及发布管理，充当“空中交通管制员在驾驶室中导航”。

Integration testing, security testing, and performance testing were all being done outside of development sprints by separate test teams. They brought this testing into the dedicated DevOps teams and automated it. Then they moved all testing into the development sprints, adopting behavior-driven/acceptance test–driven development and wiring integration, security, and performance testing into a Continuous Delivery pipeline. Today they have 700 Agile teams following Continuous Delivery. Some teams are pushing changes to production as often as 20 times per day.

集成测试、安全测试和性能测试都是由独立的测试团队在开发冲刺之外完成的。他们将这个测试引入专门的DevOps团队并自动化它。然后，他们将所有测试都转移到开发冲刺中，采用行为驱动/验收测试——驱动开发和连接集成、安全性和性能测试，并将其引入持续的交付管道中。如今，他们拥有700个敏捷团队以持续交付。一些团队正在提交变更到生产环境，每天多达20次。

Agile ideas and principles—prioritizing working software over documentation, frequent delivery, face-to-face collaboration, and a focus on technical excellence and automation—form the foundation of DevOps. And Continuous Delivery, which is the control framework for DevOps, is also built on top of a fundamental Agile development practice: Continuous Integration.

敏捷的思想和原则优先于工作文档，频繁交付，面对面协作，注重技术卓越和自动化，这是DeVOPS的基础。而持续交付，作为DevOps的控制框架，也建立在一个基本的敏捷开发实践之上：持续集成。

# Chapter 2.4 From Continuous Integration to Continuous

从持续集成到持续交付

Delivery

In Continuous Integration, developers make sure that the code builds and runs correctly each time that a change is checked in. Continuous Delivery takes this to the next step.