Assuring 2000 payment transactions per second reliably with resiliency testing

Achieving Resiliency, Reliability, and Scalability for one of the largest retail payments and settlement management agency

The story

Chaos engineering has emerged as a new testing discipline as well as a means to transform the reliability of cloud-native services. By testing not only the deployments but also the application infrastructure, chaos engineering demonstrates how systems will respond to real-world failures to proactively support system resilience.

Key Challenge: Improving Customer Satisfaction

Large financial institutions incur high costs in terms of poor customer satisfaction, and penalties when financial transactions are dropped. This typically happens when the customer base is growing heavily, teams are developing fast, and the complexity of technology increases.

Our client, one of the largest FinTech companies in Asia processing over 1 billion payment transactions in a day, wanted a solution for improving the reliability and resiliency of the overall platform that supports 20+ financial products used across industries. The customer was facing increasing issues with financial transactions dropping during peak demands on the system, causing financial loss, a decrease in customer satisfaction, and a toil on developers responding to incidents.

The Challenges

- **Significant business growth** and increased velocity of development but decreased reliability.
- **Complex technology stack** across private cloud, virtual machines, bare-metal, and more.
- **Demanding customers in a competitive market** that cannot have issues with financial transactions due to the rapid pace of market volatility.
- **Need to improve developer productivity and experience** to maximize velocity and minimize burnout.

The Solution

Solution: Platform to Improve Resilience

Nagarro's team proposed a chaos engineering solution to improve the resilience of the service. The client's stack hosted on a private cloud was built with a complex networking infrastructure consisting of virtual appliances, firewalls, switches, virtual machines, and Kubernetes.

Starting with a critical product that serviced nine million payment requests every day, our experts enabled identifying fault-tolerant targets in the infrastructure to start a controlled roll-out of reliability testing.

We zeroed in on the end-to-end automation of chaos experiments in their delivery pipelines and production as the solution to fix the transaction-dropping issue.

Laying the foundation, the team built the Continuous Resilience Testing platform. The platform onboarded applications using Harness Chaos Engineering to run resiliency tests against critical components of the application across the web, application, and data tiers. Nagarro had the customer adopt the "shift-right" approach and ran the tests in production, leveraging the following chaos faults to validate the resilience mechanism's disruption that could occur from real-world failures.

- **Instance delete**, which reproduces a forced instance failure on specific or random replicas of an application resource and checks how the application recovers.
- **Resource CPU Hog**, which consumes the CPU resources of the application container, simulating a CPU spike and testing the application's resilience to potential slowness/unavailability of some replicas due to a high CPU load.
- **Network Latency** to inject latency between resources and test the application's resilience to an unreliable network.
- **Memory Hog** to consume the memory resources on the application container, simulating conditions where application resources experience memory spikes and testing how they respond.

Common resilience mechanisms that were tested, tuned and validated to improve resilience:

- **Timeouts:** Limit the impact of long-running requests. Prevent slow requests from overloading the system and causing system outages.
- **Circuit Breakers:** Allow a service to continue operating when a related service fails, preventing cascading failure and giving the failing service time to recover.
- **Retries:** Retry a failed request multiple times until it succeeds or when it hits the retry limit. Used to increase the success rate of requests in distributed systems.

Results

16X Reduction in Failed Transactions

Resiliency tests helped discover vulnerabilities in service recovery, application design patterns implementation, and optimized configurations. The automated reliability tests ensured high resilience of critical application components.

16x reduction in failed transactions: Identified configuration issues in resilience mechanisms to ensure applications were optimized for peak performance.

Reduced mean-time-to-recovery (MTTR) to 10 minutes: Developers were able to validate and test monitoring dashboards, alerts and improve recovery scripts to minimize downtime.

Improved customer satisfaction by 10x: Being able to meet SLAs and improving relationships ensured the business was successful in scaling to support peak traffic.

Start Improving Software Reliability Today

We've heard from many companies that have begun a chaos engineering practice but have struggled to scale beyond one or two teams. This is often because they've chosen an open-source chaos engineering tool that doesn't scale or a commercial offering that isn't cost-effective in cloud-native environments.

Harness Chaos Engineering (CE) and Nagarro make it easy to start your chaos engineering journey today and scale to support your future growth. Harness CE provides more than 100 out-of-the-box chaos experiments, including those that address common Kubernetes failure modes, to test and quickly improve your application's reliability.

Getting started with chaos engineering has never been so simple. If you are ready to see how your organization can adopt this practice and improve reliability contact Nagarro for a free resilience assessment.

About Nagarro
In a changing and evolving world, challenges are ever more unique and complex. Nagarro helps to transform, adapt, and build new ways into the future through a forward thinking, agile and caring mindset. We excel at digital product engineering and deliver on our promise of thinking breakthroughs. Today, we are 19,500 experts across 35 countries, forming a Nation of Nagarrians, ready to help our customers succeed.
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