StackStorm

PEARSON CHOOSES TO THINK DIFFERENTLY WHILE REVOLUTIONIZING ONLINE LEARNING

By Dana Christensen, StackStorm Community Development

Executive Summary

Chris Jackson, Director of Cloud Platforms at Pearson, joined the company as it began a digital transformation of education delivery. With extensive technology and entrepreneurial experience gained from previous positions at Rackspace and tech startups, Jackson saw a golden opportunity to use his talent in helping democratize global access to high-quality education.

Pearson is the world's learning company, serving 75 million learners worldwide. Founded in 1844, the company has been through many transitions—from its beginnings as a construction company, to publishing, to education textbooks, and now to digital learning. Today, 40,000 Pearson employees work in 70 countries as the company aims to reach 200 million digital learners by 2025.

Pearson's journey to the digital transformation of education delivery to improve the quality of education worldwide is what motivated Jackson to join Pearson. Ask Jackson what inspires him at Pearson, and he'll tell you that he gets great satisfaction by "enabling people to work better, faster, and smarter." He's also inspired by the DevOps focus on collaboration, not only transforming technology, but also culture, business processes, learning, and the notion of meaningful work.

Pearson has a simple mission: to help people make progress in their lives through learning.

The company is focusing on the changing needs of the world's education markets, while measuring this progress against key performance indicators spanning financial objectives, business measures, and sustainability targets. One of the biggest opportunities for Pearson—and for its customers and learners—is the ongoing digital revolution, which offers profoundly new and innovative ways to address the biggest challenges

in education. Pearson is embracing this digital revolution with next-generation technology applied to the production of its future product offerings.

The way Jackson tells the team's story is that they have built a start-up technology business inside Pearson. His small team of innovators has brought the entrepreneurial spirit to Pearson with the goal of empowering and enabling Pearson developers. Jackson challenged his team to develop a platform that would put end-to-end application development, automated testing, and delivery "on rails" for the developers. The goal was to optimize and streamline digital application development, testing, and delivery without asking developers to compromise their creativity, productivity, or output.

Like a true startup, the team established a prototype and beachhead users. From there, they secured funding and broader executive support, enabling them to continue building out "Bitesize"—the new cloud platform based on containers, Kubernetes, StackStorm, and other open source technologies. Since founding their startup two years ago, the team has made tremendous progress in transforming the culture, processes, and the technology at Pearson. Bitesize, with StackStorm at the core, is part of the next-gen cloud infrastructure platform that will enable the company to push forward its vision for global delivery of digital education experiences.

Empowering and Enabling Developers

Jackson joined Pearson as Director of Cloud Platforms with the charter of building out the cloud-based infrastructure that would enable the development and delivery of the applications and services necessary to

> ❝ Open up your mind to the "art of the possible." StackStorm offers solutions to problems you may not have even thought of yet. If you step back and look at all the areas where it can start to improve ease of integration, the possibilities are endless."
>
> — Chris Jackson, Director of Cloud Platforms, Pearson

meet their ambitious transformation goals. For Jackson and the team, it's more than building a cool new cloud platform. It's about empowering and enabling the developers. It's about breaking down silos, building trust, and bringing a sense of centralized governance back to IT without the developers having to compromise their creativity or productivity. As Jackson puts it, the team needed to "wipe clear that image of the dusty gray enterprise IT function, and become a credible partner with development teams to deliver code."

Given the scope and scale of development at Pearson, this was a daunting challenge. There were more than 400 development teams using infrastructure that included 36,000 servers and more than 2,000 applications. Complexity often led to frustration and a lack of trust in IT. Slow, bureaucratic processes often resulted in tool sprawl and shadow IT groups. And without standardization, rework was frequently required to maintain high quality.

True Transformation Requires Thinking Differently

Jackson and his team knew that implementing DevOps principles, such as collaboration, continuous learning, and meaningful work, would set the stage for Pearson to experience the business benefits of exponential innovation. First though, everyone in the organization had to have the same understanding of key DevOps and cloud principles.

Jackson asked his team to start with a clean canvas. They initiated exploratory conversations with

developers to identify their top difficulties, challenges, and skills gaps that they could close for the developers. They identified opportunities to "pivot in" behind developers and position themselves as trusted collaborators, partners, and advisors. Development teams needed to grow to trust that Jackson and his team had the development teams' interests at heart and were there to truly support them in their goals to innovate and create amazing new digital learning experiences.

Conversations with the development teams proved to be enlightening, and the vision for the platform began to crystalize. A large percentage of the developer teams was interested in moving beyond standard AWS/public cloud services to containerization. While this was on the developers' to-do list, they didn't yet have the skill sets necessary to move to containerization and automation. Jackson and his team realized that they could add value by building a platform that delivered a better experience for Pearson developers. As Jackson says, "if they couldn't build a better experience for the Pearson developers than a bunch of off-the-shelf tools, then their team had no right to exist."

It also became clear that the developers wanted a core platform that they could add to. They were happy to use a standardized platform and not have to develop their own build environments or manage AWS, but not if it meant sacrificing flexibility or their favorite tools. They wanted the freedom to be creative and run efficiently through a centralized, standard platform.

Based on their findings, Jackson and his team set out to build a platform that:

- Delivered a centralized platform for use across the entire enterprise

- Used container technology and event-driven automation as the core of the platform

- Deployed Kubernetes to manage the platform

- Leveraged open source solutions and the open source community

The new platform needed to address the top requirements of primary stakeholders:

– **Lines of business:** Reduce costs and accelerate time to market for new services

– **Developers:** Simplify use and standardize. Enable developers to commit code, continue to develop and iterate on applications, run through automated testing, and then deploy in a consistent manner to many datacenters worldwide—all in under an hour

– **Security:** Meet compliance requirements and deliver visibility

– **QA & performance testing:** Simplify use and increase agility with minimal disruption

– **Operations:** Streamline technology and processes being used by Pearson development and operations teams

> **We don't want our developers spending time on building out these pipeline environments. We don't want them getting sucked into non-value add activities. We just want them committing code. That's what they're good at, that's what they enjoy."**
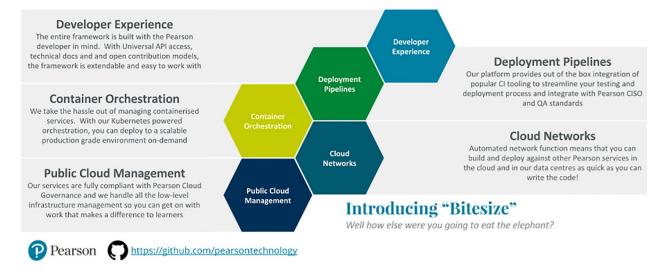>
> — Chris Jackson

Bitesize: Building a Next-Gen Cloud Platform One Bite at A Time

The result is the platform "Bitesize"—based on containers, Kubernetes, and StackStorm. The name is a play on the question "How do you eat an elephant?" The team started small, stayed lean, and built just what was required knowing if they managed the project in agile, iterative chunks, they'd quickly deliver something useful.

The Bitesize platform is designed to enable:

– Cost-effective delivery of new services

– Accelerated time to market for new services

– Ease of use, management simplicity, and standardization

– Security with visibility for meeting compliance requirements

– Ease of use, agility, and minimal disruption during QA and performance testing

– Streamlined technologies and processes for both development and operations teams

– Consistent delivery of code in a cloud-agnostic manner

– Inherent cloud portability and the ability to run the right workload in the most appropriate location

Figure 1. The Pearson Framework for Cloud Applications.

With Bitesize, the infrastructure to support standard application development, automated testing, and global deployment is handled "below the API." Developers no longer need to worry about how services are delivered. The Cloud Platform Engineering Team provides an API, "awesome docs, and a rich developer experience, and lets the developers go nuts with whatever plug-ins, UIs, and favorite tools they want to leverage."

Delivering this functionality via StackStorm, which acts as an API abstraction layer, helped solve two of the greatest challenges the team faced:

– Gives developers freedom to choose their toolsets. Managing upstream API dependencies and other calls that hang off of certain tools is one of the greatest challenges when rolling out a new feature on a centralized platform. Having this abstraction layer in place eliminates complicated dependency exercises that are required anytime a new feature is added to the platform or developers have a new tool that they want to leverage. With StackStorm abstraction, they just update the StackStorm packs and the bindings, enabling them to honor the existing workflows.

– Allows developers to do their day-to-day development work, eliminating the need to get pulled into low-level AWS management or managing integration of the various tools necessary to provide a solid CI/CD capability.

A lot of the "magic" behind the API abstraction is StackStorm, an event-driven automation platform that provides a mechanism for orchestrating "If This Then That" workflows. StackStorm not only enabled above-the-API flexibility for choice of tools, it also allows automation of functions below the API, such as tech ops, security, networking testing, and QA. Groups responsible for these workflows also use Bitesize to standardize delivery of functions. Bitesize is a win for everyone.

When talking about the platform and how it brings together the different disciplines of software delivery, Jackson muses as to where the limit is for this way of working. According to Jackson, "We are changing the way we work with all of our partner teams, such as security, QA, and operations. By helping them understand how to implement their policies and standards in code and make it available to developer teams in a more intuitive form, we are providing a mechanism to accelerate more than just infrastructure provisioning."

> **StackStorm is at the heart of everything we are doing, and is a great companion tool to Kubernetes. StackStorm provides an "If This Then That" capability for any DevOps tool. It allows us to define value chains and business processes in a way that is far less archaic and structured than some of the previous enterprise-grade automation suites."**
>
> — Chris Jackson

Why StackStorm?

Bitesize is based on containers, managed by Kubernetes. Kubernetes provides an excellent set of primitives to begin to build out a Platform as a Service (PaaS), but extra functionality is often required to build out a robust PaaS offering. According to the Bitesize team, Kubernetes has done a great job in allowing extra functionality to be added via the third-party resource object type, which enables teams to extend the Kubernetes API with a new API object type.

This is an excellent feature of Kubernetes, however, integrating each developer tool one by one in this manner would be overwhelming. Instead, StackStorm provides a single entry point to extend Kubernetes. The StackStorm API and web UI enable actions and workflows to be defined that:

– Provide a single interface for running common operations tasks

– Expose a common interface to developers/users to interact with the PaaS

– Provide a consistent interface for developers to write tools against the PaaS

– Allow developers to be creative and use their tools of choice

Once an action or workflow is defined, the API watches for changes within Kubernetes and runs whatever actions or workflows need to be run in response to the changes.

The Bitesize team quickly realized the flexibility and the power of the StackStorm platform. Using StackStorm enables Pearson to:

– Integrate stateful services like AWS RDS or MongoDB

– Integrate with AWS CloudFormation and Elasticsearch services

– Integrate with PaaS services, including Consul by Hashicorp and Vault

– Handle credential setup

– Develop a multi-cloud strategy—StackStorm also enables placing the right workload with the right cloud platform/provider

– Leverage open source for "innovation at the speed of community." There is a direct affinity between open source and what Pearson is doing in education. It's about continuous learning, the sharing of code, and the sharing of knowledge. The Bitesize team built the Kubernetes pack for StackStorm, contributed it to the community and is an active member in the StackStorm community.

– Develop on a proven, stable platform. StackStorm is built on the OpenStack Mistral workflow engine, which is a proven/stable platform.

– Vibrant open source community. Jackson said, "I personally haven't had better support in my entire career. Their community slack channel is awesome. Their people are awesome. Don't get me wrong, the tech is amazing but the people got us hooked."

> **"We wanted to open our delivery platform up to integrate with third-party resources and numerous development tools. We chose the StackStorm event-driven automation platform to further streamline the development experience. StackStorm gives us an abstraction layer between our teams, Kubernetes, and our tool ecosystem."**
>
> — Chris Jackson

Vision and Successful Execution Pay Off

Jackson's approach to Pearson's digital transformation via DevOps methodologies demonstrates what can be accomplished by engaging in conversations fueled by new thinking, exploring possibilities, and empowering teams for breakthrough innovation. It has paid off. Bitesize now supports more than 100,000 active learners. The Bitesize team now has a formal budget, and C-level support. And this is only the beginning.

Jackson envisions a future where Bitesize, powered by StackStorm, will continue to expose an increasing number of self-service capabilities for developers. It's about developing a digital runbook for managing Pearson's future cloudscape. Jackson's vision for the future of operations includes the ability to run any workflow on demand with transparency and auditability available through StackStorm ChatOps and Machine Learning. These capabilities are critical to scaling operations to support millions of containers.

Jackson's long-term vision is to take the best of open source communities and bring this model of collaboration to Pearson. Jackson is working across teams to ensure that they develop the skillsets—such as good Python skills—to bring innovative digital learning applications to market. He knows that to make a sustainable change, all teams need to be involved in the end-to-end design of automated workflow and

application delivery. His goal is to democratize the pipeline and open it up to thousands of developers within Pearson.

> **StackStorm hasn't yet unlocked its full potential, so the more people that bring their use cases to the community, the more it can evolve and grow."**
>
> — Chris Jackson

According to Jackson, automation frees up time for teams to "invest in human enablement"—sitting together, working through problems, and building community governance. It's about getting a group of developers and operators to work together, collaborate, innovate faster and have fun. And StackStorm will continue to be at the heart of technology and community transformation at Pearson, making Jackson's vision a reality.