

Cloud Budgets Keep Growing

Here's where industry and education plan to invest cloud dollars, and SaaS leads the pack.

IGHER EDUCATION IS NOT ALONE when it comes to increasing spend on cloud technologies: Gartner predicts end-user spending on public cloud services will top \$591 billion in 2023, up from \$490.3 billion in 2022, an increase of 20.7% year over year.

"Cloud computing will continue to be a bastion of safety and innovation, supporting growth during uncertain times due to its agile, elastic, and scalable nature," Gartner VP Analyst Sid Nag said <u>in a release announcing</u> <u>the forecast</u>. "Cloud spending could decrease if overall IT budgets shrink, given that cloud continues to be the largest chunk of IT spend and proportionate budget growth."

"As higher education institutions continue to **pivot toward continuous modernization** practices, the SaaS segment of the cloud is likely to see the most investment," noted Damien Eversmann, chief architect for Education at Red Hat. "Cloud resources provide the agility and flexibility needed to support the culture of change that continuous modernization demands. As long as security practices are properly maintained, cloud adoption is one of the best tools for academic institutions to stay ahead of the curve."

All cloud categories are expected to see growth in 2023:

| | 2021 | 2022 | 2023 |
|--|---------|---------|---------|
| Cloud Business Process Services (BPaaS) | 54,952 | 60,127 | 65,145 |
| Cloud Business Process Services (BPaaS) | 89,910 | 110,677 | 136,408 |
| Cloud Application Infrastructure Services (PaaS) | 146,326 | 167,107 | 195,208 |
| Cloud Application Services (SaaS) | 28,489 | 34,143 | 41,675 |
| Cloud Management and Security Services | 90,894 | 115,740 | 150,254 |
| Desktop-as-a-Service (DaaS) | 2,059 | 2,539 | 3,104 |
| TOTAL MARKET | 412,632 | 490,333 | 591,794 |

Worldwide Public Cloud Services End-User Spending Forecast (Millions of U.S. Dollars)

BPaaS = business process as a servicePaaS = platform as a serviceNote: Totals may not add up due to rounding.

laaS = infrastructure as a service
SaaS = software as a service
Source: Gartner (October 2022)



What's Next for Cloud?

In higher education, where data is king, continuous modernization is an essential approach for IT leaders, and cloud computing's potential is limited only by reluctance to embrace it.



DAMIEN EVERMANN Chief Architect for Education, Red Hat

S SO-CALLED WEB 3.0 TECHNOLOGIES and their potential in higher education shift into greater focus, the cloud's necessity as a ubiquitous foundation for learning only grows. *Campus Technology* recently spoke with Red Hat's **Damien Eversmann**, chief architect for Education, a former software developer and veteran of higher education highperformance computing research, who says fostering a culture of change is the first order of the day when implementing any cloud strategy. Beyond that, cloud's potential is boundless.

When we talk about continuous transformation and how the cloud enables that, what are the key elements that ensure continuous modernization? What is required to make that successful?

EVERSMANN: There's a lot of talk about continuous modernization or continuous innovation, or whatever title you want to put on it, but it's about "culture first." Culture is the most important thing. We can talk about the cloud, the tools, processes, and all of that, but in the end, if you haven't built a culture that is willing to accept the constant change that comes from continuous modernization – and not only accept it but really drive it – then you're not going to be successful.

Assuming we've fostered a culture that is willing to accept constant incremental change, there are really three things to keep in mind when you want to adopt this approach. First, standardization. At Red Hat, we like to call it a "standard operating environment." There are tons of tools out there that do anything and everything, and tons of ways to write and deploy applications, but at the base you need to build a standard environment that everybody who develops or buys or procures tools understands. Whether that's "We deploy everything on Linux," or "We deploy everything in Python," you need a common and accepted starting point and that's a standard operating environment.

After that, modularize everything. Containerize everything. You don't want these huge monolithic projects because it takes a lot of time to move them, change, improve, or update. Modularize everything. Build small tools – ideally, the smallest functional piece you can – to make it easier to update or fix that piece if there's a problem with it, or reuse that piece somewhere else.

Third is automation. Continuous modernization

When you talk about data and the cloud, one common topic is the democratization of data, and the fact that everyone has access to the data now, and anyone can draw their own conclusions from it.

- DAMIEN EVERSMANN, RED HAT

requires doing a lot of things repetitively. Developers have done this for decades – CI/CD, continuous integration/continuous deployment – and the idea is that we build tools so that every



time I update a little piece of code over here, it automatically gets built and tested and all of that over there. I don't have to do that manually every time. If we constantly tweak and change a thing, we need to make sure we're not breaking something else. But if my job after I've tweaked over here is to go test everything else and make sure I haven't broken it, I'm never going to get anything else done. That repetitive testing or process that I built into it needs to be automated. If you can do those three things, you're well on your way to continuous modernization.

As the cloud becomes more ubiquitous and empowers all levels of users to do things they couldn't do before, do you find that's enabling a shift in acceptance?

EVERSMANN: It's a double-edged sword for education. Every academic IT department has this nagging fear in the back of their head that somewhere, a clinical researcher stood up something in the cloud without asking or telling, and now patient data is sitting out there, unprotected, and my entire institution is at risk if something goes wrong. That's the dangerous edge of the sword; but the useful edge of the sword is that it speeds things up and makes things a lot easier to do. At Red Hat, we're working to create cloud environments that benefit researchers in data science. Whether you're a researcher at an academic institution, or a data scientist at a marketing firm, the tools that data scientists and AI/ML researchers use are changing, literally as they're using them. To maintain an environment where I am constantly able to use the latest updated tool on prem is nearly impossible. The only people who can do that at any real scale are the cloud providers.

What needs to be in place to make the most of the cloud's agility and flexibility?

EVERSMANN: It all depends on how renegade you're willing to be. I can log in to AWS and stand up an entire AI/ML research environment in an afternoon, and as long as I'm willing to keep



swiping my credit card and keep ignoring security risk, then this is an easy thing to do. Where institutions and enterprises and government agencies have struggled for years, and they still do, is cost control. It's easy to have unlimited power and infinitely up-to-date resources as long as I don't care how much it costs, so you start to balance that. The same goes for security, and that is where the culture piece comes in: If we all know what tools we're using, as long as we're happy with those tools we can make sure as a team to keep them secure.

What's possible today that wasn't possible three years ago thanks to the cloud?

EVERSMANN: Have you played with ChatGPT? It's eye-opening, the level the technology has gotten to. It's also downright frightening. I have a background in software development, and I've sat down with ChatGPT, gave it a problem statement, and it wrote executable source code to solve the problem. Is it super huge and complex? No, it was simple source code, but it's changing the way we approach problems. ChatGPT, while it does sort of maintain a context, I don't think it could maintain the context of a full enterprise software solution. But my developer who's writing a module might be able to make huge use of that, iterate back and forth, and then bring it into their workspace and polish it. That concept of jumpstarting the solution is brand new, and one of the things that makes it so frightening to a lot of us in IT is that we have no idea where we are on the S curve of adoption yet. Who knows if these tools are going to be able to do those full enterprise builds in five years.

Ten years ago, people perhaps had similar concerns about cloud-based infrastructure.

EVERSMANN: There's one big reason ChatGPT and tools like it could only exist today. When you're building out machine learning tools, they need to be trained. They need to learn, just like you and I need to learn; they're just really fast at it. What enabled the researchers who developed



ChatGPT, and the IBM researchers who developed things like Watson, to really start building usable tools was the huge amount of data they could use to train them. That amount of data didn't exist before the cloud. There was no way that any one organization could leverage that volume of data until that volume of data existed in one place.

Higher education is on the forefront of just about everything. If you look at Red Hat, we are the biggest open source company in the world, but we got that from higher ed, from the MITs and the Stanfords and the Berkeleys of the 1960s - that's where open source came from. When we talk about pushing the envelope, it's always been about higher education. Sometimes that's to their detriment, because higher education is also one of the biggest targets of ransomware, but at the same time education needs to understand that that's their job. They've set themselves up to be at the forefront of just about everything, and that's why all of the researchers want to go to universities instead of someplace else, because it's where all of the cool new ideas come from.

When you talk about data and the cloud, one common topic is the democratization of data, and the fact that everyone has access to the data now, and anyone can draw their own conclusions from it. The moment the Hubble telescope captures a new image, it's available to researchers around the world immediately. That's one of the things that only the cloud brought to us, this ability to disseminate knowledge instantly.

The security concerns hold everyone back, and that's why the whole culture piece is important. Everyone needs to understand these tools are very powerful and if they're not used properly, if we don't put the proper controls in place around our data, if we don't put the proper security measures in place and do the extra work, then someone on the wrong side of things will use those tools against us. At this point the advantages hugely outweigh the risks. You just need to go into it with eyes wide open and a welldefined plan. If you've got that and a culture for security, you're off to a great start.