SUPPORTING THE NEXT-GENERATION CLASSROOM AT RED ROCKS COMMUNITY COLLEGE WITH Z BY HP AND NVIDIA

Author: Mike Leone, ESG Senior Analyst; and Josh Clark, ESG Research Associate

ABSTRACT At Red Rocks Community College (RRCC), IT and instructors work together to best support the ongoing development of the student body. As part of that development, the math department jumped at the opportunities to leverage computational machine learning platforms that presented themselves. And with the right guidance, infrastructure, and support, RRCC could deliver a next-generation educational experience.

By working together with Z by HP, RRCC is now supporting student research, Python in the classroom, and a department content drive, all from a single workstation.

RED ROCKS COMMUNITY COLLEGE AND MACHINE LEARNING

For Bill Cherrington, the IT Director at RRCC, ensuring that the right technology is available to the instructors and students is paramount. That means regularly working in collaboration with the Innovative Technology Advisory Council (ITAC), where instruction and information technology experts meet to work out ideas about using new technology to support and advance curriculum.

Cherrington worked closely with the math department to support the vision of teaching and enabling students to harness the power of machine learning. The first step was to support Python usage directly in the classroom, as machine learning is a new math topic in the curriculum. One particular class covers areas such as k-means clustering and k-nearest neighbor, as well as support for vector machines and feed forward networks, leveraging the open-source library TensorFlow with Keras. And since this was a projects-centric class, students were required to interact with modern data sets to solve complex mathematical problems.

Additionally, Cherrington required support for student research projects. This is where students would extend what was learned in the classroom and apply those learnings to real-world use cases. They would leverage convolutional neural networks, natural language processing, and recursive neural networks to conduct everything from WiFi traffic analysis and online comment classification to elevation analysis, cancer diagnosis, and protein folding.

Challenges

The department traditionally relied on business-class workstations with off-the-shelf graphics cards. As with any classroom, there is a large emphasis on providing every student access to whatever technology is available. The students would rely on bringing in open data sources from the internet and Github and using Python to build models in their class. With tens of students across two classrooms looking to access the system at any given moment, the system was simply unable to keep up. In fact, students would need extra days, and in some cases, several weeks, to see results. This challenge was further exacerbated when students were quarantined, as remote access became yet another hurdle in the way of accessing an oversubscribed system.

Additionally, the group required the use of open-source technology, but this introduced a new set of challenges associated with keeping the software stack up-to-date and compatible with the underlying workstation. Between Linux, Nginx, Nextcloud, Python 3, Docker, Jupyter Lab, TensorFlow, Keras, RStudio, and CUDA, every update introduced the risk of downtime. Cherrington and his team constantly struggled to keep up with what to update, when to update it, and what the impact would be on the workflow or workload. Unfortunately, this is common challenge across the industry, as it is easy to get overwhelmed with the puzzle of updates required to maintain reliability, optimization, and uptime.

Requirements

RRCC needed a system that delivered high levels of performance, supported greater concurrency, and enabled data access, data interaction, and collaboration. Equally important to RRCC was establishing a relationship with a vendor that would listen and guide. They wanted to share their vision and work collaboratively with a technology vendor who could advise, guide, and support them in a timely manner, as they hoped to expand usage across several classrooms and several departments. Enter Z by HP.

MODERN TECHNOLOGY FOR THE MODERN CLASSROOM WITH Z BY HP

Today, RRCC leverage a first-generation HP Z8 workstation. And it has given them the capacity, scale, performance, and reliability required to support their use cases. Students can now use their own personal lab environments built on Docker containers with Jupyter Hub to access Python examples and lectures. Student researchers can access collaborative data sets and share computational resources. And Cherrington and his team gain peace of mind knowing that the end-user experience is consistent for all students and helps achieve better uptime, reliability, and support.

Performance

Z by HP addressed RRCC's performance challenges by delivering a robust system that includes two Intel® Xeon® CPUs, 192 GB of RAM, 6 TB of NVMe storage, and two powerful NVIDIA RTX 8000 GPUs. And the effect has been significant savings in the amount of time it takes students to complete projects. What used to take students weeks on the old system can now be completed in hours for more students at the same time.

"*We have been able to significantly reduce the time it takes to complete a process. What started out as weeks, we can now do with the new server in hours. The growth has opened up interest in other curriculum areas.*" -Bill Cherrington, IT Director at Red Rocks Community College

One very specific example of

an important performance benefit can be seen when students take a final exam. Before moving to the Z by HP, students would start their finals on Friday and would not have a result until the following Friday. With the Z8 workstation, results are now completed over the weekend.

Cost

There are limits to any institution's budgets when purchasing new technology. Z by HP helped RRCC get their money's worth with the HP Z8 workstation. Z by HP worked with RRCC to provide them the proper system that was right for their needs. Knowing their circumstances and the allotted budget, they provided them a future-proof Z8 workstation that would enable them to support not just present requirements, but also future requirements, through a workstation that could easily be updated, reworked, or downsized as needed.

"*We do not have a lot of money to be making wrong decisions. HP understands that and provides not only the best solution, but the most cost-effective solution that will work with an open-source architecture.*" -Bill Cherrington, IT Director at Red Rocks Community College

The Z8 and the way that we have constructed them affords our students access to cutting edge hardware and industry software tools. It allows for RRCC to introduce data science concepts, computational mathematics, and cutting-edge research without additional student costs or the need to outfit classrooms with additional hardware.
Bill Cherrington, IT Director at Red Rocks Community College

Collaboration and Support

Having set up their devices to use open-source software, neither the students nor the institution is required to buy any software, allowing students to access the material on demand. Through collaboration between IT, the faculty, and Z by HP, the final platform was correctly sized to fit the classroom's needs.

"It is not just placing RAM, processors, video cards, and an SSD into a machine; there is a lot more thought and process that has gone into our Z8 devices. They brought in their Technical Engineer and their AI Educational staff to understand our individual issue. It [RRCC's relationship with HP] is not just a vendor-client relationship; it is a partnership between two entities striving for the same goal. For Red Rocks Community College to be successful in this endeavor, we needed their solid products and expertise." -Bill Cherrington, IT Director at Red Rocks Community College

Remote Access and Reliability

With the current pandemic requiring most schools to embrace a hybrid form of education between in-home and in-person, RRCC needed a way to meet those needs. When utilizing Z by HP's workstation, the students are given the ability to access the platform remotely. This makes the resources available all over, not just sitting in the corner of a classroom.

"Math classes are spread throughout the building, so it makes much more financial and logistical sense to build a remote platform as opposed to making and maintaining additional costly physical computer labs around campus. It also allows for on-demand access to all these tools on and off campus, allowing students to learn when they like and where they like. This last part is especially important, as we need more and more remote resources as we navigate the current pandemic." -Bill Cherrington, IT Director at Red Rocks Community College

And from an IT standpoint, the reliability of the system has reduced maintenance windows dramatically. What used to require 2-hour drives, in-person visits to classrooms, all-nighters

THE BIGGER TRUTH

It was important to RRCC's faculty to create a custom, open-source platform that students can remotely access and, through shared resources, use to interact with high powered computational tools. Z by HP worked collaboratively with RRCC to configure a workstation that enabled the expansion of their ideas and would continue to fit their ongoing philosophy. And having achieved such great success in their initial deployment, they are now in the early stages of implementing the same system and workflow into more classrooms in different departments, including chemistry, physics, and biology. Access and use of machine learning will offer more students the opportunity to improve data literacy in their respective fields. And Z by HP with NVIDIA will be there to meet their requirements as RRCC continues to modernize and revolutionize their approach to education.

THE Z BY HP SYSTEM USED BY THE RRCC IS CONFIGURED AS FOLLOWS:

Hardware:
• First Generation HP Z8 Workstation
• 2x – NVIDIA® RTX 8000 GPUs
• 6x – 32GiB DIMM DDR4 Synchronous Registered (Buffered) 2666 MHz (0.4 ns)
• 2x – Intel® Xeon® Gold 6136 CPU @ 3.00GHz
• 3x – 2Tb NVMe drives
• PCIe v3.0

Software:
• Ubuntu Linux®
• Docker
• Python 3 with Jupyter Lab, TensorFlow, Keras, and RStudio
• Nextcloud

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