Succeeding with Hyperconverged Database Platforms

How public sector enterprises can optimize their IT environments and simplify their transition to cloud technologies
Government and higher education organizations often require elaborate databases to manage large volumes of data and transactions. As these technology consumers transition to the cloud, they face unique challenges around speed, flexibility, scale and security.

One way to overcome these challenges is to adopt an approach that takes hyperconverged infrastructure (HCI) to the next level. HCI virtualizes the three tiers of data center hardware (storage, compute and network), typically on commodity equipment. A natural evolution of HCI is to add databases, hypervisors and application stacks to hardware designed specifically for organizations that place heavy demands on their databases. Think of it as a hyperconverged database platform. Ideally, this platform would use the same technology for public and on-prem clouds, potentially streamlining the process of migrating applications and modernizing IT environments.

This paper outlines the challenges and opportunities of hyperconverged database technologies for government agencies and higher education institutions transitioning to the cloud, and offers best practices to implement such a program successfully.

**Challenges: The Current Landscape for Public Sector IT Leaders**

Government and higher education organizations often have sprawling IT operations with entangled legacy technologies. Many IT leaders hoping to modernize and simplify with cloud services, hyperconverged infrastructure and other next-generation tools have a lot to work through.

Liberty University, a private university based in Lynchburg, Va., illustrates the scope of the challenge. The university has more than 125,000 students, with over 110,000 studying online. The infrastructure to support such an expansive online learning environment must be robust. Liberty made the transition to a hyperconverged database infrastructure years ago (see sidebar on page 3).

“We, as an institution, are very data hungry,” says Joshua Frejosky, Liberty University’s Director of IT Operations. “The demands we put on our IT systems are exorbitant.”

Large public institutions, like their private enterprise colleagues, often manage massive volumes of data or process vast quantities of transactions. Muscular, high-availability databases are mandatory.

Hardware engineered specifically to improve database performance was the market’s response to this mandate. Ideally, the hardware would include hyperconverged infrastructure to deliver the agility and scale of virtualization. This was the backdrop for the emergence of Oracle’s hyperconverged-database platforms like Exadata introduced in 2010 and its smaller cousin the Oracle Database Appliance, introduced in 2011.

In the years since the emergence of hyperconverged infrastructure, public agencies and universities have tiptoed toward the public cloud, where it’s easy to spin up testing and development environments. Thanks to virtual processors,
Serving more than 100,000 students imposes incredible demands on the IT systems at Liberty University. For most of the past decade, the university has met that demand with Exadata hardware from Oracle. This hardware transcends the conventional virtualization of storage, networking and compute in a hyperconverged infrastructure. These machines accelerate performance because they’re purpose-built to optimize Oracle’s signature database technologies.

All the university’s critical data runs on this system, including business- and student-related data. The system supports applications for student information and enterprise resource planning.

“We’re also replicating that data almost instantaneously to a secondary system that we call our data warehouse,” says Joshua Frejosky, Liberty’s Director of IT Operations. “That’s where the predominant amount of our reporting and predictive analytics is happening.”

These systems help the university stay engaged with current students while finding inventive ways to attract new students — generating better business outcomes.

The Exadata-based system replaced a mishmash of technologies that generated a panoply of problems when things went amiss.

“Prior to that build, it was commodity pizza box hardware,” Frejosky recalls. System crashes were too common for anyone’s comfort. Identifying the culprits triggered rounds of finger-pointing.

“When you’ve got three or four different vendors’ architectures working together for a single solution, they’re all going to blame the other one for problems. Troubleshooting issues was always this nightmare,” Frejosky says.

The new technology unified disparate systems in one box, improving troubleshooting, resiliency, stability and overall performance of the environment. “I won’t say it was ‘night and day,’ because that doesn’t even cover the difference we felt once we moved into a complete Engineered System.”

Steven Crowder, Liberty’s Senior Database Administrator, says the unified technology makes life much easier. “You have one go-to vendor for your hardware issues, software issues and bugs. You almost get to where you take it for granted.”

Crowder says Liberty’s IT team had to reimagine database management.

“Initially, we were very worried about putting all of our databases in a single cluster because they were so big,” he recalls. Oracle developed tools to overcome those concerns.

Thus, there’s no need to fear database consolidation, Crowder concludes.

Liberty University Embraces Hyperconverged Database Platforms
network switches and storage, all it takes is a few keystrokes to allocate space and launch proof-of-concept projects.

But agencies and universities often resisted the cloud because they needed to maintain tight security and governance over their IT infrastructure — including their databases.

“Historically, the public sector space has been a slow adopter of cloud computing,” says Randy Hardee, Vice President for Technology at Mythics. “They found there were security compliance requirements that couldn’t be met by public cloud suppliers and providers.”

Regulatory frameworks for cloud computing like FedRAMP help ease some of this resistance. And the COVID-19 pandemic changed a lot of minds because cloud tools streamlined the adoption of remote work technologies like virtual desktop infrastructure. “They’ve really now been pushed to start moving their infrastructures to the cloud,” Hardee adds.

Hybrid environments that blend private and public clouds provide an appealing approach for IT teams. This appeal extends to a hyperconverged database platform that can unify cloud technologies and databases in a single device.

Of course, any IT organization adopting this technology must reconcile it with a host of legacy issues. Many agencies and universities have aging software that isn’t compatible with the latest cloud technologies, which hampers their attempts to innovate.

Moreover, organizations have often accumulated a sprawling portfolio of software licenses over the course of several years. Vendors make it easy to download copies of their software, but in a large IT organization, this can be difficult to straighten out.

“If you’re not keeping track of what you’ve downloaded or how many cores you’ve spun up, you may be using a lot more software than you’re actually licensed for,” says Kevin Ort, Mythics Director of Infrastructure and Open-Source Technology.

Many states, meanwhile, are fighting IT sprawl by reeling in their IT operations.

“A lot of state and local governments have been focused on high levels of consolidation in their IT strategies and IT funding,” Hardee says.

The State of Texas, for instance, had data centers scattered across the state several years ago. “And every single one of the data centers housed one or two departments or agencies,” Hardee says. Now, the state has converged everything under a single Department of Information Resources. Florida, Georgia and many other states have adopted similar approaches.

Consolidation and hyperconvergence go hand in hand. Organizations that otherwise could not afford to invest in a massive technology refresh may be able to find the budget for a hyperconverged solution in a consolidated IT ecosystem. Moreover, agencies and their technology vendors often have a strong incentive to modernize in pursuit of cost savings, scale and agility.

Agencies considering a migration to a hyperconverged database platform need a strategy to ensure the optimum solution for their requirements. That can be a daunting challenge.

“There are things that you can do to shape the software to your environment and things you can do to shape your environment to the system,” says Scott Dickson, Enterprise System Architect with Oracle North America Cloud and Infrastructure Solutions. “You’re going to have to figure out which are the right ways to push and squeeze based on the level of effort and the value returned.” (See sidebar on page 5 for more on developing a cloud migration strategy).

Understanding the value of a hyperconverged database platform is essential to developing a sound cloud migration strategy.

The Advantages of Hyperconverged Database Technologies

An all-in-one appliance combining databases and hyperconverged infrastructure has multiple benefits for IT systems in government and higher education. These benefits include simplicity, efficiency, compliance and license management.

Single-vendor simplicity is one of the leading attractions of hyperconverged database platforms. Top vendors in this
Embracing hyperconverged technologies opens a path to cloud adoption. After all, hyperconvergence is a fundamental cloud technology because virtualization abstracts cloud hardware into digital components that are easy to duplicate and automate. Leading hyperconverged database platforms use identical technology in on-prem and public clouds, simplifying cloud transitions. Thus, organizations considering hyperconverged database technology cannot ignore the potential of the cloud. “The common technology, whether it’s a database or things like Kubernetes and containerization, make it so easy to move applications and begin deploying things,” says Scott Dickson, Enterprise System Architect with Oracle North America Cloud and Infrastructure Solutions. “I don’t have to go all in right now,” he adds. “I can figure out how these technologies benefit me on my premises while I’m maintaining data sovereignty as I look for the best place for different applications at different points.” Dickson has helped a host of large organizations map out their optimum cloud environment. He notes the common administration and licensing in a hyperconverged database environment creates a level ramp for moving to the cloud. Yet for all the simplicity of hyperconverged technologies, organizations still need a sophisticated cloud migration strategy, Dickson says. This starts with analyzing how apps and databases interact in the cloud. “It’s really important to understand how your applications relate to one another,” Dickson says. For instance, hosting applications in the cloud while keeping databases on premises can create latency that slows application performance. Finding opportunities for automation is essential to a migration strategy. “Let’s take advantage of data center-as-code so folks don’t have to be sitting there doing repetitive, mundane things,” Dickson advises. “They can automate that and then be moving strategically towards the next step.” A migration strategy must include the basics like timing the move to avoid business disruption. And it must answer the questions that bedevil any technology transition. Dickson points out the key strategic points to consider: “A migration strategy starts with, where am I now? What do I have to do now? What do I need to do to keep my lights on and to make those decisions strategically, so I don’t box myself in or make moves in my on-premises data center that hurt me later on?” Always weigh the financial implications of a migration, Dickson says. Thinking strategically can help prevent costly mistakes.
space install all the technology on a dedicated appliance, reducing system sprawl while streamlining configuration and management.

“You don’t have to figure out what server to buy, which version of the database to put on that server, how to tune that database to work on that server, how to deploy that into your environment, how to connect the networking so that it works properly and how to connect that to your storage so that it works properly,” says Kevin Ort of Mythics, the Oracle integration partner. That’s a welcome improvement in complex enterprise environments because a single vendor is responsible for resolving problems.

Moreover, deployments happen much faster because most of the engineering work is done. “So, instead of taking weeks or months to bring up a new database system, we’re doing it in hours and days,” Ort says.

This accelerates time-to-value for government IT leaders, Randy Hardee of Mythics says. “It’s just the whole life cycle-cost equation: faster implementation and much less time and energy in the operations and maintenance.”

Hardee recalls a customer in Florida that was enduring at least two or three unscheduled outages per month on its old patchwork of systems from multiple vendors. Implementing a hyperconverged database solution changed everything. “They didn’t have an outage for the next three years,” he says.

Security and compliance are also simpler and more efficient. “Since it’s a known piece of hardware, a known piece of software and a known configuration, security is now easy to deploy and manage,” Hardee says. “I’m not worried about downloading critical patches every six days, and then deploying it and hoping it works.”

Hardee adds: “There’s only a half dozen known configurations that I have to worry about, which is usually the cause of most problems when you talk about maintenance and patching. If you have a configuration that’s made out of four different vendors’ gear, you never know what’s going to break when you apply a patch.”

Limiting license sprawl is another core advantage of a hyperconverged database platform. Ort explains that vendors often allow easy downloads of software that can lead to spiraling costs. The top vendors provide tools that place tight controls on licensing. “This is huge from a cost containment licensing standpoint” he says.

A hyperconverged database platform also streamlines cloud migrations because of the heavy emphasis on

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**What to Look for in a Hyperconverged Database Platform**

The best suppliers of hyperconverged database technologies promise:

**Integration**
The hardware is optimized to integrate with the vendor’s database software.

**All-in-one simplicity**
The single vendor should provide an end-to-end solution, including hypervisors; database management; and virtualized compute, networking and storage.

**Cloud readiness**
The platform should readily adapt to hybrid environments and migrations to the public cloud.

**Licensing**
Management tools should limit redundant licensing and enable cost controls.

**Cost savings**
Vendors should be able to identify specific economies over the life cycle of the platform.

**Compliance**
Automation and scripting should ensure adherence to patching and regulatory policies.

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Scott Dickson, Enterprise System Architect, North America Cloud and Infrastructure Solutions, Oracle
virtualization. Software like Kubernetes and innovations like containerization are essential cloud technologies that dovetail with hyperconverged database systems. "It's not just a consolidation or a linkage of technologies," says Scott Dickson of Oracle. "It's a linkage of technologies and engineering in the broader sense, including the financial, compliance and policy aspects." (See sidebar on page 5 for more on cloud migration strategy).

Best Practices for Implementing a Hyperconverged Database Platform
Partnering with a solution provider or system integrator is the typical path for government agencies and universities transitioning to hyperconverged database technologies.

Consulting with solution providers is central to the adoption process. These consultants can help gain stakeholder buy-in. Since decision-makers find cost savings appealing, customers should start out looking for opportunities to economize.

“The key to getting stakeholder buy-in, in my experience, is asking how are you handling your licenses — is your license spending a concern to you?” Kevin Ort of Mythics says. Ort notes that many large, complex environments have so much license sprawl that a careful analysis can reveal potential for substantial savings. That's bound to warm up the leadership to the potential of a technology upgrade.

Conversations about vendor lock-in cannot be avoided. “There is a high degree of vendor lock-in because you're buying your entire stack from one vendor,” Ort says. The flip side, he adds, is the simplicity in resolving difficult problems. “When we can show customers how much more simply their environments will operate, they usually embrace that and then move forward.”

It’s also helpful to consider the services contracts available from solution providers.

“Don’t try to do everything on your own,” Ort advises. While these technologies deliver simplicity to the end user, configuring them is inherently complex. “When customers tend to have problems, it’s because they try to do it on their own and get frustrated when it takes longer than they expected, or they run into issues they don’t know how to deal with,” Ort says. “So I would say, always take the services. It might be an additional cost that you’ll be thankful for later.”

Examples of services might include system startup: migration, taking systems online, making the data move over correctly and so on. System integrators may also offer on-demand services that connect the customer with an expert engineer for a specified number of hours.

Scott Dickson of Oracle expanded on the value of working with a savvy technology partner for complex projects like a migration to the cloud.

“People who have their environment and their data center know how to run it really well,” he says. “But they're not necessarily the ones who move it and migrate it from place to place all the time.” His advice: "Take advantage of someone who has been through the migration many times and has seen things that make life easier or harder. This is somebody that can lead you through the minefield and help you achieve a successful deployment.”

He adds, “I tell people all the time that the value that I can bring is not just that I've seen how to do it right, but I've seen what happens when people do it wrong.”

Steven Crowder, Database Administrator at Liberty University, has worked on multiple generations of hyperconverged database platforms. His advice for his data center colleagues implementing these tools: “Let the vendor's experts do what they're good at. Let them manage the project. Let them walk you through the steps of getting it implemented.” Vendors typically have extensive training and learning resources. Be sure to take advantage of them, he adds.

Moreover, keep an eye on the long-term horizon of the technology. “Really think critically about the environment you're putting it in and try to make sure you're looking ahead three to five years,” Crowder says.

Charting a Hyperconverged Path to the Cloud
Combining hyperconverged infrastructure with database technology represents the evolution of virtualization, which transformed the IT landscape of the 21st century. These tools create ample opportunities for simplicity, cost savings and security for public sector organizations looking to transition to hybrid and public cloud environments.

While the cloud is ideal for virtualization, it’s not a cure-all. Frejosky, Liberty University’s director of IT operations, advises a careful, measured approach to the cloud, fine-tuning everything to an organization’s specific needs.

“Our approach is never cloud-first or cloud-last,” he says. “It's just cloud smart.”

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