Dell Digital: Inside Our Transformation

New for 2022
As Dell Technologies’ IT organization, Dell Digital believes the path to digital leadership must be strategically and culturally designed around people, process, and technology. Our agile development processes enable us to stay product-focused, with fast and continuous delivery, and we’re working even smarter – using AI and ML to drive better outcomes and simplifying and automating IT processes to achieve greater scale.

We have many powerful examples of teams from IT and the business partnering to develop and deliver new ways of creating better customer experiences, driving down costs, and improving employee satisfaction. The results of our transformation are shared in the following pages, which I hope you will find useful as you consider new ways to create better digital experiences for your own teams, customers and partners.

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See how Dell Digital enables transformation in action and drives impact every day.
By Jaynene Hapanowicz, CTO & SVP, Dell Digital – Technology Transformation and Services Development

Several years ago, Dell Digital, the internal IT team at Dell Technologies, did a study that showed us something that most IT organizations have long struggled with—a lack of developer productivity. We found that our developers were only spending an estimated 20% of their time writing functional code. The rest of the time they were dealing with administrative tasks like provisioning infrastructure, running quality and security scans and getting their code into production. This required coordinating with change and release management, operations and a variety of other dependencies across the organization.

Faced with that nagging statistic, we decided to double down on creating a developer experience that could support them so they could spend most of their time doing what developers do best—creating solutions for the business. This is what all companies are trying to do as they accelerate their digital transformation agendas.

I am happy to say that we have cracked the code on how to create great experiences for our developers—to let them run faster and do the work they like to do without being bogged down in administrative tasks and manual processes.

Our approach is multifaceted, including a fully automated cloud with a catalog of robust services and a fully automated DevOps pipeline that has resulted in skyrocketing development productivity and quality.

Three years into our journey, our developers are now spending between 70% to 75% of their time writing functional code and using their innovative talents to introduce new solutions and add value to our company. They can provision the infrastructure they need in a matter of minutes instead of days, weeks or months, and quickly deploy the code in a standardized and automated manner using our CI/CD pipeline.

Moving beyond manual

When you go back several years at Dell, it could take 70 or more days to build an infrastructure before a developer really started writing the first line of code. This continues to plague many companies still using manual processes to build an environment.

Many times, you had to have a one-off design, order hardware, get approvals, receive it, get it racked and stacked, connect to the network, apply security settings, download the operating system, add configurations and then build your services on top, depending on what the workload was designed to do in that environment. Administering all these manual processes to build an environment is overwhelming and not an efficient use of time.

Along with the hugely time-consuming back and forth of manually building an infrastructure, the other burdens are the manual side of change management and of running code through quality and security scanning tools in disparate places. These activities have everything to do with the setup of the environment and nothing to do with writing functional code.

This is why developers turn to public cloud providers to get infrastructure services at the swipe of a credit card.

We knew the solution was clear, albeit challenging. We needed to adopt a maniacal focus on automating everything we do in our IT environment.

Automation, automation, automation

Making the transition to automation is a marathon, not a sprint. We began to build the automation of infrastructure services back in 2016 and pushed for a real change toward adopting DevOps across the organization the following year.

Uniquely, I had previously run the infrastructure team and pivoted to the DevOps team in 2019, I spearheaded a joint effort by both
teams to drive automation. I understood both sides of this equation and how important it is to have empathy for the challenges that both infrastructure and development face. Only with both teams working together is it possible to transform your IT environment.

On the infrastructure team, we had to determine what automation capabilities we were going to use and how we were going to spin up those environments. This included creating capabilities that automated the provisioning of virtual machines (VMs), a network to build and segment containers, load balancing, security, database and caching services. We used, and continue to use, VMware technology, including VMware Tanzu for self-service cloud-native solutions and NSX for networking.

We also had to determine a reference architecture defining how our services were going to be built in a standardized yet flexible way. We took an API-first approach for everything that we built and incorporated that into our architecture. We worked closely with the development teams and created a self-service catalog that lets developers define and choose the capabilities they need—compute, network, database, etc. Today we have provided an environment that lets developers build what they need in five to 30 minutes.

**A single DevOps pipeline**

In parallel with infrastructure automation, the DevOps team worked to create all the automation services that a developer needs to optimize their job. We started by analyzing the more than ten pipeline solutions that had evolved around different development organizations over the years and defining the strategy of what we needed our single comprehensive pipeline to do.

Working with the development teams, we built a path with all the integrations and blueprints our developers needed to deploy their code. And then we migrated all teams to a single pipeline platform.

Developers write test cases, write their code, test the code against the test cases, deploy it into staging, perform code fixes and redeploy. They also need to run a variety of security checks before, during and after deploying into production. All of that is automated in our CI/CD pipeline.

We use third-party vendors and in-house capabilities to create service integration points to put everything that a developer needs at their fingertips—from scanning code for security vulnerabilities, to checking for 12-factor coding best practices, to credential management.

Our API-first approach to developing code has yielded further development efficiencies. Developers can share APIs via our API marketplace. APIs are acting as gateways to unlock digital assets and data for use by IT and other internal business units and departments, as well as external businesses, customers and partners.

Our CI/CD pipeline has resolved what was a massive time suck for developers when they used to do all these steps manually.

Our pipeline, coupled with our catalog of automated infrastructure services, has created what we’re calling an industry-leading developer experience.

**Skyrocketing productivity, quality, efficiency**

The benefits of our transformed developer experience are clear. Developer productivity is going through the roof and quality is significantly better. The time it takes us to address defects is dropping and the development feature cycle time is reducing, which means our efficiency is climbing.

We expect to finish our current fiscal year with 21 million pipeline job runs, doubling from last year. We have achieved more than a 35% increase in overall developer productivity in 2021 alone. The quality of the code has improved, the frequency of deployments and features have increased and the number of production incidents has sharply dropped.

Overall, cracking the code on creating an industry-leading developer experience means we have the velocity we need to shift more of our focus to innovation and driving business solutions forward. ■
By Suzan Pickett, Director, Software Engineer IT – Infrastructure Architecture

In IT, it’s understood that users, particularly developers, don’t like to wait to get the infrastructure they need. Dell Digital, Dell’s IT organization, has an internal cloud service portfolio to ensure they don’t have to.

We call it our Dell Digital Cloud—a centralized self-service, marketplace for internal business partners, stakeholders and some 9,000 developers to consume our infrastructure services. In a step towards self-service nirvana, it lets developers and infrastructure engineers alike get what they want, when they want it, without IT getting in the way.

Dell Digital Cloud runs on Dell’s hyperconverged infrastructure (HCI), namely VxRail and PowerFlex, at the heart of our modern data center. Users can provision services—virtual machines (VMs), containers, data services, databases and more—in less than an hour compared with waiting weeks via a typical IT provisioning process.

Replacing tickets with on-demand

Traditionally, someone would request an IT service through a queue-based ticketing system like ServiceNow and that request would go into the system. It would be vetted and approved, and then move through the system with queue wait times and people doing their work in a very waterfall approach.

With the cloud portal, Dell Digital no longer needs to curate what users can have or when they can have it. Instead, we curate the services on the back-end and create strong standards that tie the service catalog into our security, compliance, governance, monitoring, reporting, etc. We still have all the rigor around what we’re doing.

Available to everyone at Dell, portal users are primarily developers and an occasional product team. It is used across business groups, including product groups, cybersecurity and team member experience.

Getting IT out of the way

Besides the fact that developers and other IT users have, of course, always wanted access to what they need without waiting, there were several other reasons we decided to create the portal.

One is that building out our private cloud environment over the past three years using Dell and VMware technology has resulted in infrastructure that lowered our cost to serve, reduced provisioning time and increased agility. We’ve automated many processes, providing users on-demand access to platforms, databases, compute, storage and networking via self-service.

Dell Digital saw a need to make a public cloud-like experience for our developers and our internal business partners and that’s what we did. By creating stronger standards in this catalog that people are consuming, it mimics a public-cloud experience and a cost structure that is highly competitive, which is a common expectation with today’s workforce.

If a user still needs services on a public cloud service and they have a viable business reason, we can assist in brokering those services using Dell-approved top-level accounts and security parameters. By offering users a multi-cloud approach, Dell Digital has visibility into what users are consuming. We can also ensure adherence to our security policies around public cloud usage. If user demand for a particular service in the public cloud reaches a pivotal threshold, we often add those services internally, repatriating those workloads to the Dell Digital Cloud to take advantage of our substantial cost and performance benefits.

We provide portal users with show back on the cost of the services they provision, along with the ability to “try before they buy” services for 30 days.
We also have a team dedicated to working with our stakeholders, offering consulting on how to onboard into the portal. If users have a traditional legacy application and want to start consuming some of these services to gain efficiency and higher performance, we help them find the best way to do that.

**An API marketplace**

We operate in a product model approach to add and iterate on features, based on feedback from developers and other stakeholders. While the portal is often the focal point of the conversation, all the back-end services that the portal uses are APIs. They are available through the Dell Digital-wide API marketplace, where our public and private APIs are cataloged and managed across Dell Digital.

Many of the workflows are directly accessed with APIs from CI/CD pipelines and other key software initiatives and the experience is much more streamlined for our developers and engineers.

All APIs in the marketplace are vetted via our CI/CD development pipeline, where they are validated and tested before being published.

We are continuing to expand our catalog to gain self-service efficiency across our IT infrastructure, from the basics like VM and container provisioning to day-two operations including how we secure, grow, manage and maintain the services.

As a company that shows our customers how HCI can help them gain flexibility, automation and standardization to improve business velocity, our internal Dell Digital Cloud is proof of practicing what we preach to remove IT as a barrier to services.
By Ashok Muthukrishnan, Director, Software Engineer IT – Development Ops

Growing our self-service platforms

We initiated our application modernization by implementing cloud-native platform Pivotal Cloud Foundry, now VMware Tanzu Application Service. It provides a turnkey cloud-native framework and offers automated, self-healing and efficient lifecycle management features for both public cloud and on-premises workloads.

With Tanzu Application Service, our developers can select the environment they need—focused primarily on containers—from ready-to-use infrastructure. They don’t have to worry about working with the infrastructure team to provision infrastructure, or the database team to provision a database. The platform takes care of creating and running the containers in a multi-tenant platform-as-a-service.

If a developer wants to create a container, for example, the network, cluster and namespace configurations are all set up in the catalog and ready to go. The developer can select that option and start using it within minutes. Because not all development solutions can be accommodated with the Tanzu Application Service platform, we also use Tanzu Kubernetes Grid—a container orchestration platform that offers more choices for applications that may need added components. A solution, for example, may need to run database-as-a-service, or run an application that has integration with storage.

Developers can decide which infrastructure components they want and how they will fit together with Tanzu Kubernetes Grid. Container orchestration is for the developer that wants some cloud features but also wants the flexibility to fine tune the underlying infrastructure the way they want to. At the click of a button, Tanzu Kubernetes Grid uses APIs and a set of configurations to go provision what is requested.

At Dell Digital, Dell’s IT organization, our transformation mantra is to remove infrastructure complexity for our developers so they can focus on creating solutions to meet business demands. That means deploying the right application platforms to provide ready-to-use capabilities securely and efficiently.

We are using VMware Tanzu to create a resilient, highly scalable platform-as-a-service in our private cloud that helps our developer community succeed.

Four years ago, Dell Digital began to modernize many applications, transforming monolithic solutions into microservices and migrating them to our private cloud. We are continuing to expand on providing fast, simple IT capabilities for developers at the touch of a button, along with comprehensive resource monitoring, end-to-end security and automation. With Tanzu Application Service and Tanzu Kubernetes Grid, Dell Digital provides developers with an experience comparable to that of public cloud providers internally within our private cloud.

As a result, we now have some 71,000 Tanzu Application Service containers and 28,000 Tanzu Kubernetes Grid integrated pods deployed across six data centers at Dell. And those numbers are climbing rapidly each quarter.

Our developers are able to use a self-service portal and automated DevOps to provision the capabilities they need within 20 to 30 minutes and start building applications, compared to a traditional IT provisioning process that would previously take months.

HELPING DEVELOPERS SUCCEED WITH THE TOUCH OF A BUTTON —
Find out how Dell IT is using VMware Tanzu to remove complexity for its developers.
Any application that supports business solutions and any capability that is built as a service uses one of these two platforms.

We offer an expanding selection of container capabilities for our developers through an internal self-service catalog called the Dell Digital Cloud.

**Automation and visibility**

Besides creating a marketplace of self-services where developers can instantly provision what they need, we also use VMware Tanzu to enable us to provide management, monitoring and security capabilities.

The platform services let developers see what they are using, how their solutions are utilized and the performance and health of their systems. We provide insights into how their containers securely move from build phase all the way to production phase.

The platforms measure what resources developers are consuming and analyze how much they might require in the future. They also provide auto-scaling of applications to meet changing demands. If added capacity is needed during increased holiday sales, for instance, apps can automatically scale up and then scale down when demand drops.

Zero downtime on platform upgrades and maintenance is another crucial feature of our system. We are able to support apps without interrupting their operations. Tanzu enables seamless upgrades of the technology stack below hosted applications, so that our services are always able to benefit from the latest features without having to cope with long, labor-intensive outages for upgrades typically associated with legacy infrastructure.

Tanzu helps us enable all of these capabilities to create a cross-datacenter, active-active data environment which provides data synchronization and load balancing between data centers to offer improved availability, resiliency and fast recovery.

**Added network security**

In conjunction with Tanzu Application Service and Tanzu Kubernetes Grid, we leverage another VMware product called NSX-T to improve network security within our modern container ecosystem by using network segmentation. With NSX-T, we can create network zones and rules on who can access them to further refine our security.

We are also working to deploy Tanzu Service Mesh to our platform in the future which will help us move from perimeter-based security to zero trust. Service Mesh is going to take care of the end-to-end protection with the last mile security enabled.

Overall, our application platforms with Tanzu technology provide a self-service, secure and efficient environment where developers can focus on building creative solutions for business users instead of worrying about procuring infrastructure or securing, scaling and maintaining applications. We are continuing to enhance those capabilities every day.
By Harsh Acharya, Vice President, Commerce Services

A simple idea can spark big transformation. Case in point, what began as an experiment by my team to speed up our efforts to provide customers with a better online shopping experience at Dell has revolutionized our entire Global eCommerce delivery along with website architecture across the company.

We are using an architecture approach called micro frontends (MFEs) to break up webpage components into smaller building blocks that can be plugged into a page, or unplugged, to quickly construct the customer experiences we want. Like building blocks, these MFEs are made to fit in any webpage design model and offer a consistent look and feel to customers across all eCommerce pages and functions.

That means eCommerce product teams and their counterparts for other Dell websites can share common component MFEs to rapidly create new user experiences or webpage changes instead of building them from scratch.

With some 25 MFEs already in use across our pages, we are increasing reusability, extensibility, gaining faster speed to market and achieving consistent brand experience on our consumer and business-to-business eCommerce sites.

Bringing agility to the front

The MFE transformation stems from two problems our team faced. First, we realized that when different eCommerce teams needed to deliver new customer experiences on our webpages, we were building the same things over and over again.

Always eager to adopt innovation, our organization had made great strides when it came to using data, APIs, and lean software development methods to provide responsive experiences on the backend of eCommerce.

Several years back, we became one of the first organizations at Dell to adopt agile and iterative software development methods, breaking up monolithic applications into microservices that greatly improved our ability to meet changing customer needs quickly. We were already sharing backend components. But when it came to delivering responsive frontend user experiences, we were still reinventing the wheel with each new or upgraded page.

We needed to create an architecture that would allow our teams to build user experience components that could be reused and used by other teams to foster speed of delivery.

The second challenge was that individual teams were building all these different user interfaces, which led to completely different user experiences (UX) for similar purposes from page to page. We wanted to drive consistency in user experience while also accelerating UX delivery.

That’s how our architecture and engineering teams came up with the concept of using MFEs, which addresses both problems.

MFEs are essentially UX components made up of a combination of user experience elements, data and the microservices they call upon. That means each page fragment can be built in a way where it can be reused in other places.

We began experimenting by creating MFEs around our most common user experience elements, the header and the footer on each page for Dell.com. As sharable components, we could make these features consistent across our site. We then tackled components for elements like product information, price tags, etc., and kept expanding the approach. We now have dozens of MFEs that are being used across all our user experiences. Any page creator can pick up these modules from our repository and reuse them.
**You build it, you own it**

Another aspect of the MFE approach is the accountability it creates. The team that built that specific MFE owns it and is responsible for updating it or fixing any issues that arise. That way, no matter where the MFE is being used, a single team addresses its maintenance since it is within that team’s domain. As the MFE owner makes enhancements, the component automatically updates wherever it is being used.

For example, the eCommerce Account Management Experience page is owned by the Account Management team. However, it is using MFEs that are owned by many different product teams. The header is built by the Shop team. Order status and device information are owned by eSupport. The Account Management Team is responsible for uniting the experience together to make it best for customer. But they don’t have to reinvent the wheel and learn how, for example, deliveries work. They can simply pull that component, plug it in and build a high-quality experience.

The Account Management Team only has to focus on their domain expertise. Everything else keeps enhancing itself as the MFE owners make upgrades. What’s more, any other team whose pages include account management can consume what our team has built rather than rebuilding it themselves.

**Rethinking experiences**

Like most transformations, the MFE strategy did require us to make people, process and technology changes. From a people standpoint, our teams had to start thinking beyond building a single experience to instead building an experience that other teams could use as well—more of a platform approach. It required a mindset change that their team was now responsible for many experiences, not just their own team’s experience.

Another challenge has been building MFEs that could be used by applications that used different technologies. Not all teams use the same user experience technology. There were many experiences that had been live across the company for years and it wasn’t practical to try to force everyone to use the same UI technology. We had to find a way to make them technology agnostic.

Our solution was making MFEs consumable via two different options: either on the server side, when the pages are being composed or on the client side, when the pages are being rendered. By developing MFEs that leverage native browser capabilities, we are able to support different technology stacks. That provides architectural alignment across teams regardless of technology.

As eCommerce began expanding use of our MFE, we partnered with other teams to expand both MFE creation and adoption across Dell Digital. Beginning with eSupport and expanding further, we shared what we built and asked to use what they had built. It worked.

We currently have about 25 MFEs being shared across our 96 eCommerce teams as well as with other organizations. We expect eCommerce will contribute some 35 to 40 MFEs as we progress in the near future, including a focus on the checkout space.

The MFE approach continues to grow across Dell, providing other organizations with the efficiency, consistency and speed to market that we spearheaded nearly two year ago in response to a basic problem in need of a solution. No longer reinventing the wheel, we are now leading the MFE trend which is gaining popularity across the web design industry.
The other day, I was on a drive across country when it was time for me to join a work meeting. My wife was at the wheel. I opened my laptop and, using the hotspot in my car, connected to my team’s chat session the same way I would if I was in the office. I didn’t miss a beat as we cruised down the highway.

It is that seamless experience Dell Technologies’ IT Team Member Experience organization (TMX) is working to provide for all 130,000 of our team members around the globe—secure access to any resources on any trusted device, anywhere, at any time. TMX has been developing a remote-first approach to providing IT services to our users for several years. That effort became even more important as we shifted our employees around the world to working productively from home in a matter of weeks in early 2020.

From modernizing our network to improve access to Software-as-a-Service (SaaS) applications, to deploying unified endpoint management and edge security for all our devices, by leveraging our strong collaboration with VMware, we’re achieving our work-from-anywhere goals.

Adapting to shifting network challenges

Inside Dell, we’ve been using apps like Zoom, Microsoft 365 and Teams to support employee productivity for several years. As more team members used SaaS apps—and the internet in general—while within Dell facilities, Multiprotocol Label Switching (MPLS) traffic has increased dramatically, leading to escalating costs and strained capacity of our Wide Area Network (WAN).

As a result, in 2019 we began rolling out a Software-defined WAN (SD-WAN) to create a control layer in the cloud, virtualizing and centralizing how the network managed a mix of traffic using internet-based transport and MPLS depending on the needs of each location and demands. We used VMware SD-WAN by VeloCloud—a solution that provides a WAN software overlay—to modernize our network.

That enabled team members to access SaaS apps without using a virtual private network (VPN) while remote.

As our workforce shifted to primarily working from home and team members continued to use SaaS without a VPN connection, we faced a new problem. Because employees weren’t in the office or connected to VPN, we couldn’t manage and secure their devices with our traditional on-prem management tools and security tools.

To solve this problem, we needed to migrate users to a modern cloud security stack that would provide endpoint security and management. We chose VMware Carbon Black Endpoint and VMware Workspace ONE.

Carbon Black is cloud-native endpoint security software that is designed to detect malicious behavior and to help prevent malicious files from attacking an organization.

Because Carbon Black is a cloud solution, as soon as users turn on their notebooks and they’re on the internet, Carbon Black sees them and provides protection. No VPN needed. We have now fully deployed Carbon Black across our remote ecosystem for virus protection at the edge without reliance on our network.

Secure app delivery to any device

We are also in the process of deploying VMware Workspace ONE, an intelligence-driven digital workspace platform that helps us more securely deliver and manage any app on any device. Workspace ONE provides patching and security upgrades for software. My team can manage devices, patch and secure the environment without the need for a VPN connection.
Workspace ONE can also give users seamless, uniform access to our applications from anywhere via a single interface. Let’s say you use a certain SaaS app on a daily basis. You go into the Workspace ONE catalog, click on that app, and get access. You can see the same catalog on a mobile device, on the VDI, on your Windows, or Linux system. You have the same user experience.

An application could be browser-based, or you could download it by going into the catalog and clicking install.

Workspace ONE also provides users with seamless access to resources within Dell’s network without going through the multi-step authentication process of traditional VPN access. It connects users seamlessly to inside resources without requiring codes or passwords.

Because your device is managed and secure, Workspace ONE will open a tunnel for you automatically for access inside Dell. That mean you get the same experience connecting to Dell resources whether you are working at home, in the office or on the road.

We have currently deployed Workforce ONE to about 30% of our workforce and expect to complete the roll out by the end of January.

Looking ahead

Going forward, as Dell Technologies looks to have team members return to the office, Dell TMX will be working to create dashboards and gather telemetry about how we are serving our workforce across all devices wherever they are used. We are also working to tackle some new workforce challenges that have arisen as we worked from home over these many months.

One is meeting fatigue—the fact that home-based workers who can’t confer with colleagues in person are now engaged in a steady stream of online meetings that can weigh on participants. As meetings return to the conference room, we are looking at new technology to increase connection among participants, both in person and virtually.

One possibility is enhancing teleconferencing features to make remote and in-person participants equally visible. Among technologies we are exploring is virtual reality capabilities. Maybe, for example, using such technology, avatars of participants can be virtually in the same room collaborating and sharing virtual tools such as whiteboard and others.

One thing we’ve noticed with having so many team members meeting via conferencing tools such as Zoom or Teams is that it’s actually shifted the equity level of meeting participants. Previously, meeting attendees in the physical conference room had better access and were more visible than those tapping into the meeting remotely. Remote conferencing has actually leveled the playing field in meetings, since participants are all joining with the same tool and are heard and seen equally. With everybody on the call, anybody can talk, anybody can see each other, everybody can interact.

We hope that by improving the meeting experience overall we will help alleviate meeting fatigue and increase participation and visibility as we return to office.

Like seamless application and resource access, we are committed to giving team members the same meeting experience no matter where they are or what device they are using. It is all part of our strategy to create a work-from-anywhere experience for our 130K strong global workforce.

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Eighteen months ago, I spearheaded an IT team to better equip data scientists to build artificial intelligence (AI) and machine-learning-driven-processes (ML) at Dell. As we gathered feedback, I was prepared to identify resource gaps and create the tools needed to fill them.

What I wasn’t prepared for was the fact that some 1,800 data scientists and analysts were already immersed in AI and ML projects across the company. AI and ML were not pursuits of the future at Dell. They were already happening. And they were doing so outside the realm of IT.

I quickly realized IT didn’t need to shape the data science and analytics at Dell. It needed to improve the resources that those already driving that effort had to get the job done easier and more efficiently. In a fast-moving world where weeks and months really matter, they needed better compute, storage, software, data access, and a more efficient path to production, while continuing to pursue their already abundant data science and analytics paths.

My real job was to democratize data science not to dictate its direction.

Cloud-like Data Science Tools

We spent four months as a team interviewing data scientists, engineers, and analysts from an array of business units to learn about their experience, objectives, and needs.

They said it was difficult to get the right compute and storage resources to do the work. It was also difficult for them to get the latest software on an ongoing basis because it was open-source-centric, which means the software tools are constantly evolving. Then there was the arduous task of finding and bringing the data into a workspace in a timely manner—that alone could take two to three months. And finally, once they created a model, it was difficult to deploy it to production.

Based on feedback, the team set out to build an internal cloud-like platform to provide data science practitioners with self-service access to the AI and ML tools and resources they required.

Using Dell’s product development model—a user-centric, simplified, and streamlined approach to quickly design, develop, iterate and deliver new capabilities—we built proprietary software on top of Dell’s private cloud infrastructure. The new system provides all the capabilities data scientists need, including software, compute, and storage environments for them to do each step of their work.

It features four components:

A workspace to build and train AI and ML models to create a prototype that leverages on-demand and elastic storage and compute resources.

AI and ML Ops standards that offer a path to deploy completed prototypes into production, so they can integrate with apps and processes to add value continuously.

The ability to have automated access to data sets in a secure and privacy-compliant manner.

A knowledge base that helps them be more efficient throughout the data science process.

The biggest risk from the start was getting users to adopt our tools. Initially, we had 10+ different tools that were not fully meeting user needs. We started small and enlisted two data scientists to test our platform. We grew to 25 users within the first couple of weeks. By building the capabilities with data scientists’ participation, they became our advocates, and we grew past 500 users by the end of our first year. Given our current velocity, we aim to have 1,500+ total users in the next 12 months.
Centralized vs. Federated Data Science

One major challenge IT faced in tackling data scientists’ requirements was recognizing the need to shift away from a traditional centralized approach. It was important that data science stakeholders be able to continue their efforts independently.

Data science, after all, is being pursued across many business units to address very specific business needs. For example, in sales finance, we have a team that is just focused on using AI to set and manage quota guidance.

We realized in this case, centralizing the knowledge of the many businesses where data science was taking place didn’t make sense. IT was never going to know how these things need to be built to address such specific requirements. We had to acknowledge that innovation could only happen close to the business problem and the business customer and involve them in writing application code.

On the other hand, there were clear ways that centralization was important. For instance, if you want to win at AI, you have to have access to large compute and storage pools. These 40+ data science teams, however, only had access to their individual, small computers to pursue AI. Everyone was paying for compute, but they were still ending up with inadequate compute resources. By establishing a centralized cloud environment, they could access powerful compute, storage, and other resources to pursue solutions more efficiently at lower costs.

What we needed to do was centralize the infrastructure and the data security but maintain a decentralized process for actual data science projects.

We generally see data science take root in organizations in two ways: a central approach in which a single organization oversees all AI or a federated model where IT provides the platform and business data and scientists leverage them to pursue AI independently. At Dell, we already had a flourishing federated operating model that we are now supporting and enabling to grow.

Dell-on-Dell Environment

We built our Enterprise Data Science platform using Dell technology, including Dell PowerEdge 740 servers, Dell ECS for data object storage, Dell ScaleIO for block storage and Tanzu Kubernetes Grid for container capabilities.

One of the early key decisions we made was to enable container-based workloads to allow users to leverage many of the modern software engineering DevOps capabilities. Being able to put a data science model in a container with Tanzu Kubernetes, let IT provide data scientists with the flexibility to choose their own tools.

Data scientists focus on building their models and processes within a container, and, as IT, we focus on making sure the models are supplied with the right compute resources and deliver automated compliance from a security and privacy perspective.

This approach enables us to use the underlying hardware on-demand, effectively reducing compute and storage requirements by 70%, while at the same time giving each data scientist a larger compute pool to tap into.

Rethinking Policies

From the start, the move to a federated model that empowers data scientists meant we had to rethink and modernize our policies, from security and privacy to software application policies and networking practices. Previously, for example, you could only deploy into production if you were an IT team member. We adapted that process by providing automated guardrails that let business-hosted data science teams build algorithms that can integrate with production environments in a way that complies with our policies.

Our data science users now tell IT we are moving in the right direction, with a centralized AI, ML, and Ops practice that gives them the freedom to move at the speed of our customers and business. We are continuing to refine our democratization of data science.
By Francisco Garcia, Senior Director, Data Science

When IT launched an Enterprise Data Science platform in 2020 to help data scientists build artificial intelligence (AI) and machine-learning-driven processes (ML) at Dell, a key challenge was whether the 1,800 team members already engaged in data science across the company would adopt it.

With platform use up by 50 percent over the past year and growing, as well as an expanding demand for more data science capabilities, Dell IT is continuing to invest in AI and ML. We are now looking to a much broader challenge on the horizon: making everything at Dell AI- and ML-enabled across all our applications.

Central to realizing that vision is making the data science process better and faster by improving data scientists’ end-to-end experience.

What we’ve learned

Earlier, I described the creation of the Enterprise Data Science platform. That platform is now supporting more than 650 users and is on course to reach 1,000 users by the end of this year. As a result, the Enterprise Data Science team has been looking more holistically at the data science experience. We’ve discovered several key insights that are helping to focus our ongoing investments.

First, we found that with data science, one size doesn’t fit all. There are three types of data science users—teams that are just forming, nascent teams that have delivered first wins, and mature teams seeking advanced capabilities. While the first type of user wants something that is simple and ready to go, the third type wants a lot of customization that will help them access large compute pools or deploy and integrate models.

We are working to meet these diverse needs with standardization, blueprints and automation. And we are meeting them in another critical way as well, by providing an IT team that data scientists can turn to directly for advice and help.

Although there are different data science personas, all have a few common needs. They all start with data—the need to discover it, acquire it, process it securely and analyze it for patterns and insights. They typically work in an iterative fashion, i.e. get data, analyze the data, interpret it and validate results and then go back to the first step and get more data. It is a “rinse and repeat” cycle to find what supports their hypothesis, which generally stems from a business opportunity identified by a subject matter expert and handed off to engineers and data scientists. The faster this cycle happens to validate hypotheses, the better the results the data science team can deliver.

The Enterprise Data Science platform team is working on tools that will help speed up these repetitive processes—in particular, automation of data access and processing, which is where data science practitioners spend the most time.

Currently, data scientists must figure out on their own where to find the data they need across Dell’s various databases and how to access it. They might search through tables or ask around to find what they are looking for. Imagine hundreds of people doing that repeatedly and in silos. As they do this work, they are effectively finding and creating value from information by defining what is the data that is most useful to optimize a process.

Our goal is to help data scientists to move faster, as well as to capture the valuable data they create. To achieve this, we are collaborating with our data scientists to identify the top areas they get data from and come up with a solution that will standardize the process to discover, acquire and process data from these locations. The idea is to allow them to access data instantaneously and securely from our Dell Data Lake and any other main data repositories across the company.

Once the data scientists obtain the data, we provide them the support to version, document, test and catalog the new data features they create, to make them available across other data science teams.
All our capabilities are driven by APIs (Application Programming Interfaces) which we bundle into internally developed SDK Packages (Software Development Kit) for data scientists. This helps them easily engage with our technology through the language of their choice (e.g. Python) in a very simple and efficient manner.

**Getting to AI models faster**

Beyond the data piece of their work, data scientists share common needs around the other steps of their development process, including using algorithms to solve the problem they are tackling and then building and training the model that delivers the desired result.

As we’ve scaled our support of data scientists, the team has identified that most data scientists set up very similar algorithms for specific functions in their models, and that invariably, they begin their work using small amounts of data and then focus on making their models scale with time. Yet, we see each one of our data science team members starts from a blank slate on each project.

The Enterprise Data Science team has a sub-team that specializes in DevOps for AI and ML, working to provide templates and infrastructure setups to help data scientists go faster in getting their models up and running and scaling them more efficiently. Our aim is to enable projects to go faster from ideation to production. To achieve this, our software engineering team is working closely with data scientists to first understand and drive several use cases to success, and then identify where the process is repetitive and create solutions.

Our initial work has guided us to begin creating baseline algorithms, which means data scientists won’t have to start from scratch in creating their models each time. In a similar fashion, data scientists can tap into blueprints that help them easily parallelize workloads, leverage specialized compute instances (such as GPUs) and help them train and re-train algorithms at scale. Our first templates are included on every workspace in our AI/ML platform and they just have to open them and make their modifications to get going. Our initial data tells us our users can go from idea to production six to 10 times faster using these tools.

**Smoothing out the last mile**

From a customer and business perspective, the most important step in data science is the “last mile” of the process—when AI and ML models are implemented into Dell applications to gain value from new insights and innovations they bring. Here too, the Enterprise Data Science platform team is working to add speed and efficiency by providing templates, training and support.

To accelerate these tasks, the team places a lot of focus on skills transfer and training. On the one hand, we have to train data scientists to build more deployment-ready models, using standardized technology that our engineers can understand and quickly implement into apps. On the other hand, we have to help engineering teams become more familiar with data science technologies to smooth out deployment at production scale.

The team is currently focused on seven production engagement cases for pushing new data science models into IT apps. This will help our engineers to define patterns toward standardization and creating common architecture. We hope to reduce such implementations, which could previously take several months, down to six to eight weeks by the second half of 2021.

Data science, AI and ML are the areas of technology that change the most and at the same time represent a big opportunity for us to improve our customer experience and business outcomes. We have made great strides in improving the data science process that is fueling innovation across Dell’s business units and will continue to develop standard and automated capabilities to add efficiency.

But perhaps our biggest success is supporting data science in a much more direct, non-automated interaction. When data scientists and engineers have questions, they can reach out and someone in IT will pick up the phone. And we learn from each interaction. That’s what our Enterprise Data Science team is all about.
Our Journey Continues

We hope you enjoyed this inside look at our transformation journey. We strongly believe the path to digital leadership must be strategically and culturally designed around people, process, and technology. To this end, we remain committed to continually transforming and improving everything we do. We invite you to stay up to date on the latest inside Dell Digital by reading the Dell Technologies blog or by visiting Our Digital Transformation.