DELL Technologies

WHITEPAPER

Accelerate Innovation and Productivity with Application Modernization

This white paper describes a phased approach to application modernization detailing modern software best practices to follow for optimal business outcomes, including faster development and increased efficiency.

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Executive summary

Many of today's successful enterprises have targeted application modernization in a multi-cloud infrastructure as a top strategic objective. With ongoing digitization across business and society, enterprises recognize that modernizing applications are critical to accelerating innovation, improving productivity, and reducing costs.

This white paper describes how customers can significantly accelerate and streamline application modernization with a phased approach. The white paper also highlights the complexity of legacy environments and common stumbling blocks enterprises encounter when modernizing applications.

Honed from our experience of collaborating with thousands of customers on their application modernization and cloud journeys, this approach provides a guide focused on modern software best practices. This includes accelerating and optimizing application placement, work-run-fly cloud adoption, path to production, cross-functional teams, and enterprise-wide engagement, along with continuous learning and improvement at every stage.

Introduction

Software and digitization are dramatically changing and improving how enterprises develop and sell products and services. These innovations help enterprises respond faster to market opportunities and adopt a more agile, customer-centric strategy. Users have become accustomed to immediate responses and real-time access through their consumer experiences with services like Amazon and Uber. This is especially important with customer-facing applications, but employees have come to expect more as well.

Application modernization with DevSecOps, agile development and continuous delivery, and containers and microservices are critical building blocks for success in a digitized world. Let's look more closely at each of these.

DevSecOps emphasizes communication, collaboration and integration between software developers, security professionals, and IT operations. DevSecOps helps an organization produce software and IT services more rapidly, with frequent iterations. Shared responsibility, a common set of tools, and a more collaborative culture characterize a DevSecOps organization. The DevSecOps movement has enabled organizations to accelerate procurement cycles and deployment of the infrastructure they need.

Next, we see the movement to a **continuous delivery model** using **agile development practices.** In contrast to traditional applications with release dates months apart, modern application development teams work in weeks-long 'sprints' that produce more frequent release cycles of higher quality and allow rapid customer feedback.

Cloud-native applications are built using **containers and microservices.** These small, loosely coupled components can be developed by independent teams and are easily re-usable. Development moves much faster than with traditional monolithic applications.

By modernizing application development, some of our customers have reported that they have been able to innovate software up to 12 times faster, reduce the cost of running applications by up to 66 percent, and achieve up to 80 percent faster patching of systems.

History shows – and as illustrated below - that while not immediate, the impact of disruptive, technology-driven shifts can be huge. Enterprises that embrace this change are likely to lead in their markets. For example, the advent of steam-powered locomotives during the Industrial Revolution created huge opportunities for railroads and enterprises that moved quickly to transport goods via rail.

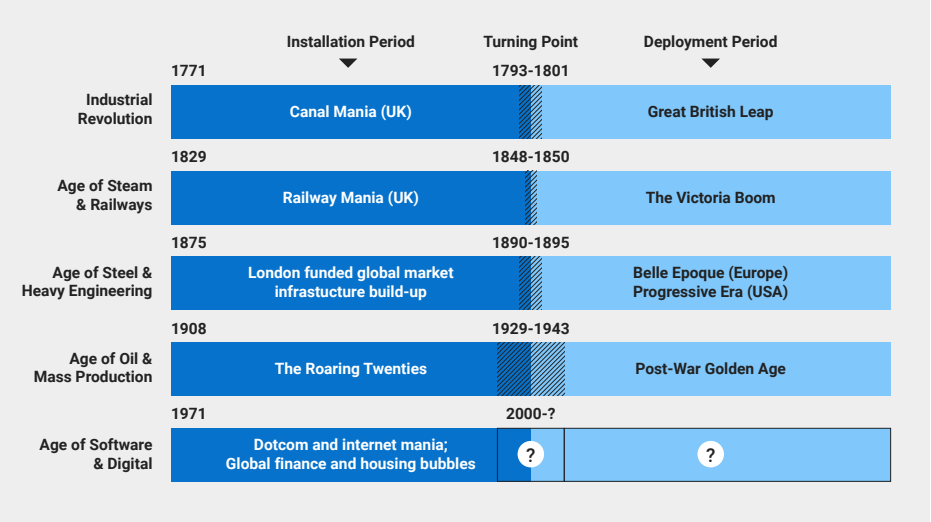

Figure 1: Disruptive, technology-driven shifts

For enterprises ready to embrace next-generation software and digitization, the challenges often seem daunting. Which applications should we modernize and in what order? Which development technologies, multicloud platforms, and processes should we choose? How do we engage and create cross-functional teams consisting of application owners and IT professionals and ensure they have the skills to operate and support modern applications running in multi-cloud environments?

At Dell Technologies Services, we have encountered these challenges and developed in-depth insights and guidance to assist thousands of organizations on these application modernization journeys over the last 13+ years. Our customers often are pleasantly surprised how quickly and streamlined the application modernization process can become when they follow a data-driven, phased methodology. To achieve optimal results with application modernization, we recommend several actions, such as:

- **Using a robust and adaptible decisioning platform to determine which applications should be modernized, replatformed, rewritten, or simply left as-is**
- **Prioritizing the sequence of modernizing applications according to risk mitigation, testing of critical assumptions, and other factors**
- **Adopting modern software practices, such as DevSecOps, as well as agile and iterative development, with a focus on continuous improvement and applying lessons learned to future applications targeted for modernization**
- **Building cross-functional teams that bridge application development and the IT organization, as well as providing modern software and cloud-native technology training and education**
- **Deploying containers and microservices to re-use code, common services and**

architecture elements across multiple applications

Legacy challenges

One of the biggest challenges that organizations face is complexity of legacy systems. Complicated deployment models and processes, along with silos of applications and systems create inefficiency and hamper productivity. For example, it can take several months for small application changes to go into production, perhaps giving a competitor a lead in introducing a new feature into the market.

With today's software and digital revolution underway, companies need a robust and agile environment to increase scalability and efficiency and reduce the high cost of legacy application maintenance. Further, running modernized applications in a multicloud environment will help them reduce operational and infrastructure cost.

Common stumbling blocks during an application modernization journey occur when organizations fail to develop and embrace a strategy and roadmap based on application placement, modern software practices such as DevSecOps, and an optimized path to production. Overlooking these essential building blocks create bottlenecks and silos, slowing and impeding progress.

Agile organizations can innovate quickly by launching features into production on every sprint cycle. Such organizations can quickly respond to failures with fast development and introduction of improved products and features compared to typically slower waterfall approaches.

To the extent possible, organizations will benefit by increasing the number of modern cloud-native applications while decreasing the number of traditional legacy applications.

Jumpstarting application modernization

Achieving business agility, faster innovation, and improved productivity calls for a phased approach to application modernization, embracing agile methodologies and running operations and performing cloud adoption at scale. The strategy considerations for this type of transformation include defining a strategy to:

- **Optimize your application portfolio to reduce cost and build a cloud strategy**
- **Increase the speed of onboarding your applications to the cloud and improve developer productivity with containers**
- **Reduce the toil and cost and increase the speed and security of the application on cloud**
- **Optimize data management and provide data driven insights from the data on cloud**

Next, consider profiling applications to identify which ones are suitable for modernization. Application profiling also assists with determining a migration strategy and landing zones for each application. Dell leverages a decisioning platform based on the "7 Rs of Workload Placement" that greatly streamlines this process while helping our customers optimize their decisions.

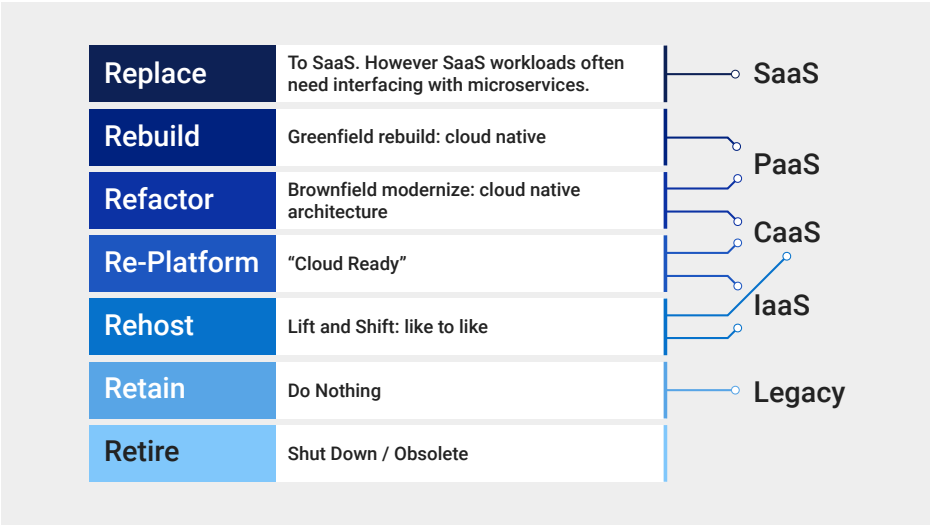

Figure 2: Application portfolio profiling

The "7 Rs" of workload placement help organizations profile their applications and categorize them as follows:

1. **Replace: Application is too expensive to run and maintain and therefore is better to replace with a SaaS product**
2. **Rebuild: Completely rebuild the application with a cloud-native architecture and host on PaaS or CaaS platforms**
3. **Refactor: Modernize application to run on PaaS or CaaS platforms**
4. **Re-platform: Make an existing application compatible to run on a cloud platform**
5. **Re-host: Lift and shift application for deployment on a different platform, such as moving a containerized on-premises application to Azure Kubernetes Services (AKS)**
6. **Retain: In some cases, the high risk of rebuilding or re-platforming certain applications, as well as compliance or legal requirements, may justify retaining the application platform**
7. **Retire: Applications with limited ROI and value should be retired**

Choosing the optimal application landing zones and target platforms depends upon balancing ease of use and design requirements. PaaS and CaaS are better models for cloud-native because developers do not have to be concerned with the underlying operating system or hardware. PaaS benefits include ease of use, fast time to market, agility, high availability, self-service, and auto scaling. However, PaaS solutions are convenient, but if vendor lock-in is a concern, then perhaps Containers are a better option. CaaS provides similar benefits to PaaS for containerized apps, and also provides orchestration services.

However, specialized workloads with resource requirements, such as third-party virtual appliances or commercial off-the-shelf (COTS) products may work best on IaaS platforms.

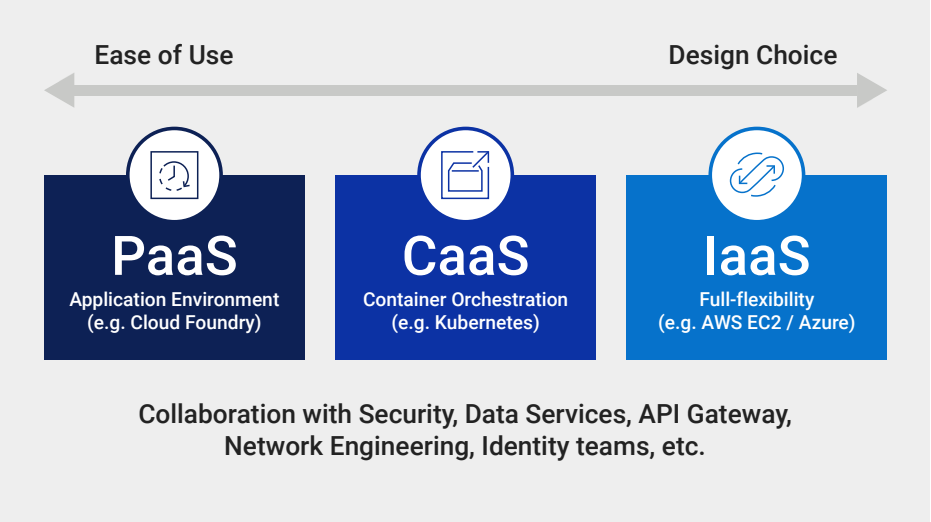

FIgure 3: Application landing zones

Accelerate cloud adoption with walk-run-fly

The next step of the application modernization journey is to identify cloud business stakeholders and end-to-end processes involved in path to production, such as baselining. With a walk-run-fly methodology, organizations can progress through the application modernization and cloud journey phases to attain the highest maturity levels while building a path to production.

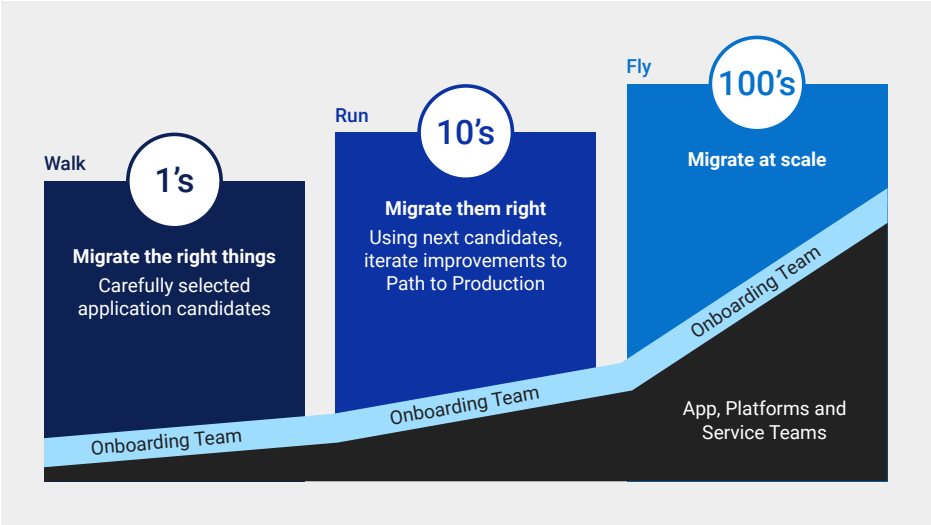

Figure 4: Cloud adoption methodology

During the **walk** phase, application teams choose one or two applications to modernize using a cloud-native architecture and go live with the applications without optimizing the path to production. The teams document and baseline the path to production and gather initial ROI metrics for applications on the target platforms.

The **run** phase involves a minimum of ten applications. Again, application teams modernize the applications, but they also focus on improving the path to production with how-to guides, patterns, code samples, improved processes and automation. ROI metrics facilitate comparison with the walk phase.

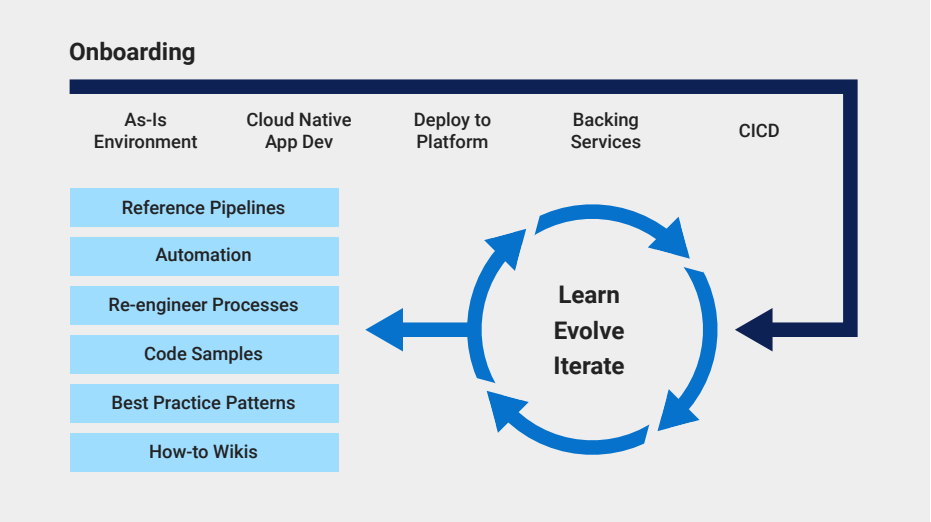

Figure 5: Path to production

Using a repeatable, proven approach to migration in the path to production helps accelerate the modernization and onboarding of the next application in the cycle and scaling hundreds of applications in just a few sprint cycles. Examples of migration factory artifacts include reference pipelines, automation run books, re-engineered and optimized processes, code samples, build libraries, best practices, architecture patterns, and how-to wikis.

In addition, building a path to production involves learn-evolve-iterate cycles that occur in parallel to application modernization sprint cycles.

An example is a cloud onboarding team who operates two modernization agile boards to track two sprint cycles in parallel for each application. The cloud onboarding team also maintain optimization agile boards in collaboration with platform and service teams to measure, analyze, optimize, and automate the path to production.

In the fly phase, with this approach, organizations can scale hundreds of applications with a highly optimized path to production that includes complete automation and self-service platforms. This phase fully realizes the ROI potential of modernization.

The cloud onboarding team scales to support all phases of the walk-run-fly methodology. Members of the cloud onboarding team include cloud-native architects who work with the application, platform, and service teams to build path to production, as well as with the application teams.

Cloud onboarding teams drive enterprise collaboration

Cloud onboarding teams play a vital role in application modernization initiatives. Your cloud onboarding teams will need to provide the following capabilities and services to ensure application modernization delivers meaningful business value and cost savings:

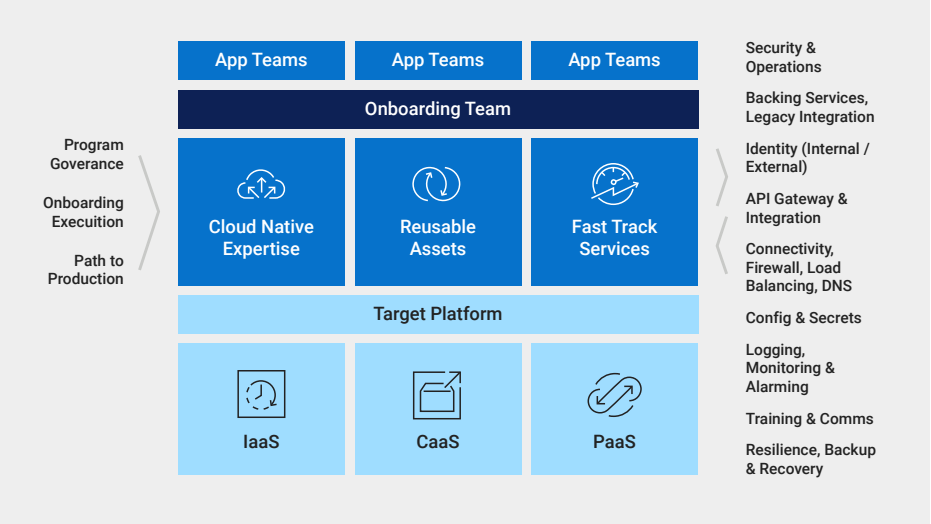

Figure 6: Driving enterprise collaboration

Cloud-Native Expertise

Cloud onboarding teams engage with application owners directly and provide expertise relating to cloud-native architecture, 12-factor applications, microservices, cloud architecture patterns, and best practices. They assess and recommend target architectures that will more efficiently use cloud resources and reduce cloud consumption costs.

In addition, cloud onboarding teams work with operations and finance to develop dashboards, cloud consumption reporting, as well as charge back and costing of cloud consumption for business units. They also collaborate with security teams to monitor, control, and secure the cloud environments and ensure target architectures comply with company policies.

Reusable Assets

Cloud onboarding teams run optimization sprint cycles to iteratively build path to production. Toward this end, they produce reusable artifacts, such as architecture and integration patterns, best practices, automation scripts, reference continuous integration / continuous delivery (CI/CD) pipelines, code samples, and cookbooks. The teams also assess and develop a pattern-of-use and obtain security approvals of the cloud provider's technology and services prior to use by application teams. This process helps fast track security certification and usage of new services for any application.

Fast Track Services

Cloud onboarding teams work closely with internal customers to dissolve organizational silos, simplify complex processes, and develop "anything as a service" (XaaS) models, including integration as a service, API gateway as a service, database as a service, logging as a service, monitoring as a service, and configuration as a service. The teams automate various services, such as security scans, and integrate them into DevSecOps pipelines. In addition, cloud onboarding teams coordinate with infrastructure teams to adapt services, including connectivity, firewall, load balancing, and DNS, to become API-based for faster onboarding.

To help teams quickly learn and adopt new technologies, cloud onboarding teams create training materials and user guides about cloud-native architecture and technologies.

Fast track services significantly accelerate application modernization and time to market. Application teams can release new features to production during every sprint cycle, enabling the organization to be more agile and innovative.

Target Platform Selection

Organizations typically run workloads in multiple environments, such as on premises, multicloud, and PaaS. It often becomes difficult for application teams to decide where to deploy their workloads. It becomes even more complex when organizations run similar platforms across multiple environments. For example, an organization may run Kubernetes on an on-premises private cloud, as well as via one or two public cloud providers, such as Amazon Web Services (AWS) and Microsoft Azure Kubernetes Services (AKS).

With specialized expertise, cloud onboarding teams help application teams select the optimal target platform for an application. The teams assess the application based on application architecture, compliance, data requirements, performance, availability, and other factors. Cloud onboarding teams also develop flow charts and self-service tools to help application teams select target IaaS, CaaS, or PaaS platforms for simple workloads.

Optimized delivery with enterprise-wide engagement

For maximum success, Dell Technologies recommends that an organization's transformation program office address the application modernization rollout on three levels:

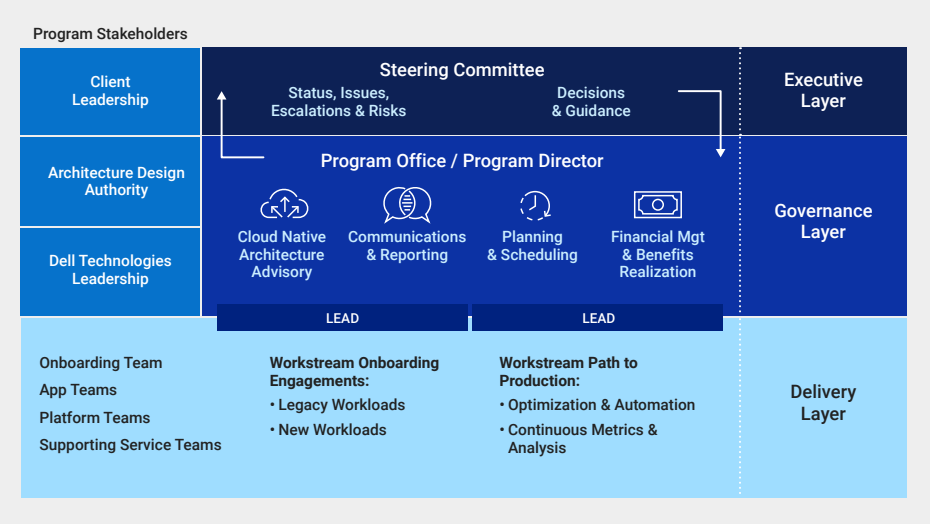

Figure 7: Program stakeholders

Executive

An executive steering committee reviews program status, risks, and escalation, provides guidance and makes decisions regarding critical program areas, and addresses issues escalated by the program office.

Governance

Led by the program director, the governance office is responsible for architecture governance, communication, reporting, planning, scheduling, and financial management. Another important objective of governance is realization of benefits and ROI. Organizations often overlook this objective due to an absence of processes, monitoring, and the gathering, analyzing, and reporting of ROI metrics about workloads migrated to the cloud. The governance office also leads onboarding engagement and path to production workstreams that are handled by multiple delivery teams.

Delivery

To deliver the solution, the cloud onboarding team leads the effort and works closely with application, platform, and service support teams. In addition, the cloud onboarding team runs two sprint cycles in parallel. One sprint focuses on onboarding engagements for application modernization and cloud onboarding backlog. The second sprint handles optimization, such as building path to production.

Meaningful business value with application modernization

A phased approach to application modernization accelerates cloud adoption, achieves meaningful ROI, and reduces costs. In addition, decreases deployment risk, improves productivity, speeds time to market of services, and boosts revenue.

Opportunity	Now	Future	Cost	Risk	Productivity	Revenue
Time-to-Market	Development lifecycles > 4-6 months	"Concept to Cash": New features possible in a single 14-day sprint				✓
App Team Productivity	Teams dependent on external manual processes, wait times, multiple hand-offs	~8x velocity improvements as DevOps team controls entire environment and service consumption			✓	
Time to Start	App teams wait > 12 weeks, manually provisioned and capacity constrained	Provision Dev, UAT, SIT environments in minutes through automated self-service			✓	
Change Frequency	Single 4 hours/month change windows (overnight!) and high-risk roll-backs	Frequent "blue/green" deployments, low-risk and any time of the day		✓	✓	
Change Risk	Even small changes to monolithic applications are high risk and require extensive planning and end-to-end testing	Low risk changes to small well-understood microservices with automated TDD testing		✓		
Platform Reliability	Monolith workloads risk outages through shared points-of-failure	"Five nines": Isolated workloads with inherent resilience		✓		
Running Costs	High cost deployment infrastructure sized for max demand, with significant idle waste	Drive >>10x compute density with low footprint containers that elastically scale out to meet periods of high demand	✓			

Figure 8: Primary value driver opportuntities

For example, we've seen customers speed time to market from four to six months to a 14-day sprint cycle. They also have reported achieving approximately 8x velocity improvement of scrum teams and automated self-service control in development, test, and production environments. In addition, the framework enables scrum teams to focus on functionality of microservices without needing to worry about the platform and deployment. Organizations could achieve 10x lower operational costs by eliminating wasteful resources and running highly scalable and available agile services.

With application modernization, developers can spin up and tear down environments in an automated fashion using CI/CD pipelines with built-in security controls. Instead of spending four hours to make a single change to an application, which involves a complex and high-risk rollback process, developers can implement changes in a low-risk environment during business hours.

Australian customer reports exceptional ROI metrics

Using the application modernization framework, Dell Technologies Services helped a large telecommunications provider in Australia modernize and re-platform a large portfolio of their applications as a part of its cloud adoption journey. Prior to the project, the customer faced several challenges, including modernizing at scale, organizational silos, complex internal processes, staff without cloud-native expertise, and a lack of cloud onboarding processes.

For this customer, we modernized and re-architected applications using a cloud-native architecture and re-platformed applications to onboard to PaaS, CaaS, and public cloud platforms. In addition, we trained customer teams to develop cloud-native skills and expertise, as well as created a cloud onboarding team with dedicated cloud-native architects to work closely with application teams.

Additional outcomes included creating fast track services, breaking down organizational silos, simplifying complex processes, and building automation scripts. We also helped the customer create an optimized path to production which incorporates reference CI/CD pipelines, automation cookbooks, re-engineered processes, code samples, architecture patterns, and a wiki

knowledge base.

The project delivered stunning results across more than 100 application teams. For example, application teams recorded approximately 8x velocity improvements and 8x developer productivity increases. We also helped modernize and onboard more than 400 applications to cloud in six months. Moving applications to cloud significantly reduced platform and operational costs, increased ROI, and improved application performance and availability.

Summary

In this white paper, we've discussed how application modernization methodologies and practices such as DevSecOps, agile development, continuous integration and delivery, and containers and microservices have helped customers speed application development, reduce the cost of running applications, and enhance system reliability.

We covered the challenge of migrating legacy applications to modern platforms like PaaS or Caas. For those applications where full modernization is not feasible, it is still beneficial to at least re-platform or re-host to a CaaS or IaaS environment.

Next, we introduced a straightforward 'walk-run-fly' methodology, with which organizations can progress through the application modernization and cloud journey phases to attain the highest maturity levels while building a path to production.

Last, we talked about the role of cloud onboarding teams in application modernization initiatives, and the capabilities and services the onboarding teams should provide. In addition, it's critical to have executive review and approval of critical program areas and to have a governance office oversee architecture, communication, reporting, planning and financial management. Next, we introduced a straightforward 'walk-run-fly' methodology, with which organizations can progress through the application modernization and cloud journey phases to attain the highest maturity levels while building a path to production.