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# Dell PowerFlex Bare Metal with Amazon Elastic Kubernetes Service Anywhere, and We Do Mean “Anywhere!”

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Anywhere, that’s a powerful statement, especially to someone who works in IT. That could be in a cloud, or in a set of virtual machines in your data center, or even physical hosts. What if you could run Amazon Elastic Kubernetes Service (EKS) Anywhere on a virtual machine or on bare-metal, anywhere, including your

running Amazon EKS Anywhere on Dell PowerFlex in a virtual environment. This time we are going further and have validated Amazon EKS Anywhere on a bare-metal instance of PowerFlex.

## The good old days

If you are old enough to remember, like I am, the days before virtualization, with stranded resources and data centers with enormous footprints to support all the discrete servers and siloed workloads, you might be curious: Why would anyone go back to bare-metal?

Having been part of the movement all the way back to 2006, it's a good question. In simple terms, what we are seeing today is not a return to the bare-metal siloed data centers of 20 years ago. Instead, we are seeing an improved utilization of resources by leveraging micro services, be that in the cloud, in virtualized environments, or with bare-metal. In addition, it provides greater portability and scalability than could ever have been imagined 20 years ago. This is thanks to the use of containers (<https://www.techtarget.com/searchitoperations/feature/Dive-into-the-decades-long-history-of-container-technology>) and the way they isolate processes from each other. Additionally, with a bare-metal platform running containers, more system resources can be directed to workloads than if the containers were nested inside of a virtual environment.

This is central to the concept of a DevOps-ready platform. In the coming weeks, we will expand on how this enhances the productivity of native cloud operations for today's modern businesses. You will find this on the Dell Digital blog (<https://www.dell.com/en-us/blog/tags/dell-digital/>) with the title Customer Choice Comes First: Dell Technologies and AWS EKS Anywhere (<https://www.dell.com/en-us/blog/customer-choice-comes-first-dell-and-aws-eks-anywhere/>).

Beyond just the economics of this, there are scenarios where a bare-metal deployment can be helpful. This includes low latency and latency sensitive applications that need to run near the data origin. This of course can include edge scenarios where it is not practical to transmit vast quantities of data.

Data sovereignty and compliance can also be addressed as an Amazon EKS Anywhere solution. While data and associated processing can be done in the data

## Digging deeper

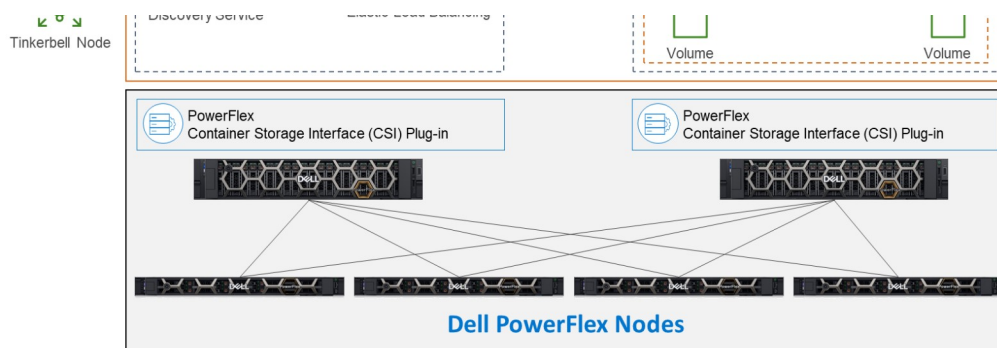
Digging deeper on this concept, PowerFlex is a software defined infrastructure (SDI) that provides a powerful tool in delivering the modern bare-metal or virtualized options that best suit application deployment needs. The hardware infrastructure becomes malleable to the needs of the data center and can take on various forms of modern infrastructure, from hyper-converged to bare-metal. This has always been a core tenet of PowerFlex.

When Amazon EKS Anywhere is deployed on PowerFlex, it becomes possible to optimize the IT environment precisely for the needs of the environment, instead of forcing it to conform to the limits of IT infrastructure. Bare-metal hosts can provide microservices for large applications, such as databases and websites, where a container instance may be created and destroyed rapidly and on a massive scale.

## The architecture

Let's look at the Amazon EKS Anywhere validated architecture in the following figure. It shows how PowerFlex delivers a unique software-defined 3-tier architecture that can asymmetrically scale compute separate from storage.

The bottom portion of the figure consists of PowerFlex – storage-only nodes (1U). In the middle of the diagram are the hosts used for the control plane and worker nodes. These are PowerFlex – compute-only nodes (2U). On the far left are the admin and Tinkerbell nodes that allow for administration of the environment. Lastly, in the top set of boxes, we have the control plane, at the top left, that provides operational control and orchestration. The worker nodes, at the top right, handle the workloads.



Let's look at some important aspects of each area shown here, starting with the storage nodes. Each storage node contains five 1.4TB SAS SSD drives and eight 25GbE network links. For the validation, as shown here, four PowerFlex storage nodes were used to provide full redundancy.

For the compute nodes, we used two 2U nodes. These two hosts have the PowerFlex Container Storage Interface (CSI) Plug-in installed to provide access to the PowerFlex storage. This is deployed as part of the PXE boot process along with the Ubuntu OS. It's important to note that there is no hypervisor installed and that the storage is provided by the four storage nodes. This creates a two-layer architecture which, as you can see, creates separate storage and compute layers for the environment.

Using a two-layer architecture makes it possible to scale resources independently as needed in the environment, which allows for optimal resource utilization. Thus, if more storage is needed, it can be scaled without increasing the amount of compute. And likewise, if the environment needs additional compute capacity, it can easily be added.

## Cluster Creation

Outside of the Amazon EKS Anywhere instance are two nodes. Both are central to building the control plane and worker nodes. The admin node is where the user can control the Amazon EKS Anywhere instance and serves as a portal to upload inventory information to the Tinkerbell (<https://tinkerbell.org/>) node. The Tinkerbell node serves as the infrastructure services stack and is key in the provisioning and PXE booting of the bare-metal workloads.

When a configuration file with the data center hardware has been uploaded,

With the base control environment operational, CAPI creates cluster node resources, and CAPT maps and powers on the corresponding bare-metal servers. The bare-metal servers PXE boot from the Tinkerbell node. The bare-metal servers then join the Kubernetes cluster. Cluster management resources are transferred from the bootstrap cluster to the target Amazon EKS Anywhere workload cluster. The local bootstrap kind cluster is then deleted from the admin machine. This creates both the Control Plane and Worker Nodes. With the cluster established, SDC drivers are installed on the Worker node(s) along with the Dell CSI Plug-in for PowerFlex. At this point, workloads can be deployed to the Worker node(s) as needed.

## Cluster Provisioning

With the infrastructure deployed, our solutions engineers were able to test the Amazon EKS Anywhere environment. The testing included provisioning persistent volume claims (PVCs), expanding PVCs, and snapshotting them. All of this functionality relies on the Dell CSI Plugin for PowerFlex. Following this validation, a test workload can be deployed on the bare-metal Amazon EKS Anywhere environment.

If you would like to explore the deployment further, the Dell Solutions Engineering team is creating a white paper on the deployment of Amazon EKS Anywhere that covers these details in greater depth. When published, we will be sure to update this blog with a link to the white paper.

## Anywhere

This validation enables the use of Amazon EKS Anywhere across bare-metal environments, expanding the use beyond the previous validation of virtual environments. This means that you can use Amazon EKS Anywhere anywhere, really!

With bare-metal deployments, it is possible to scale environments independently based on resource demands. PowerFlex software defined infrastructure not only supports a malleable environment like this, but also allows mixing environments to include hyper converged components. This means that an infrastructure can be

If you're interested in finding out more about how you can leverage Amazon EKS Anywhere in your bare-metal PowerFlex environment, reach out to your Dell representative. Where is anywhere for you?

## Resources

- Deploying a test workload (<https://anywhere.eks.amazonaws.com/docs/tasks/workload/test-app/>)
- Amazon Elastic Kubernetes Service Anywhere on Dell PowerFlex (<https://infohub.delltechnologies.com/t/amazon-elastic-kubernetes-service-anywhere-on-dell-powerflex/>)
- Introducing bare metal deployments for Amazon EKS Anywhere (<https://aws.amazon.com/blogs/containers/introducing-bare-metal-deployments-for-amazon-eks-anywhere/>)
- Blog: Customer Choice Comes First: Dell Technologies and AWS EKS Anywhere (<https://www.dell.com/en-us/blog/customer-choice-comes-first-dell-and-aws-eks-anywhere/>)

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## PowerFlex and Amazon: Destination EKS Anywhere

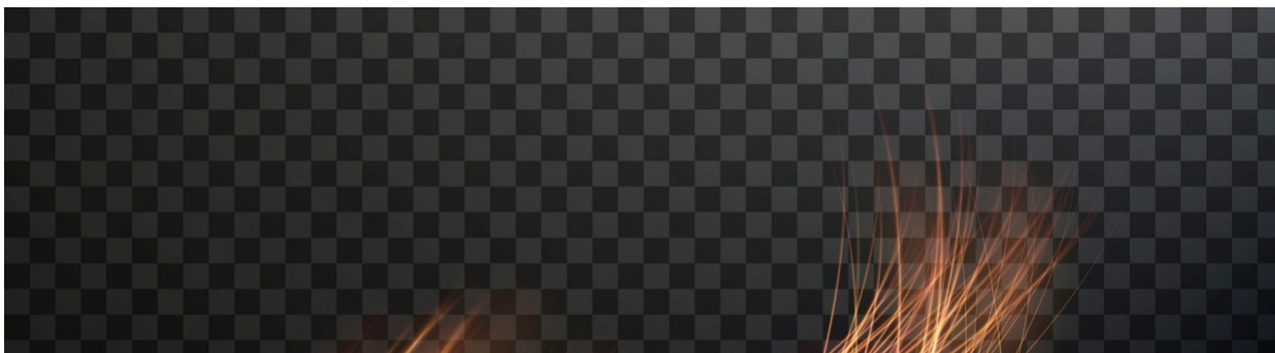
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Tony Foster

Wed, 19 Jan 2022 17:09:54 -0000 | Read Time: 0 minutes

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Welcome to your destination. Today Dell Technologies is pleased to share that Amazon Elastic Kubernetes Service (Amazon EKS) Anywhere has been validated (<https://aws.amazon.com/eks/eks-anywhere/partners>) on Dell PowerFlex ([https://www.delltechnologies.com/en-](https://www.delltechnologies.com/en-us/Products/Storage/PowerFlex)



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Florian Coulombel

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Some time ago, I faced a bug where it was important to understand the precise workflow. One of the beauties of open source is that the user can also take the pilot seat! In this post, we will see how to compile the Dell CSI driver for PowerFlex with a debugger,

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