A single Dell EMC PowerEdge R750 using Kubernetes containers supported up to 47,150 web application users across 11 instances

With a VMware vSphere and VMware Tanzu Kubernetes Grid environment, the server supported thousands of Weathervane users while meeting quality of service (QoS) requirements

Supported up to

47,150

Weathervane users

Kubernetes containerized environments can allow organizations to offer a high-quality user experience for multi-tiered web applications, such as those for online auctions and ecommerce.

At Principled Technologies, we ran Weathervane 2.1, a multi-tiered web app workload for Kubernetes, on a Dell EMC™ PowerEdge™ R750 server running VMware® vSphere® and VMware Tanzu Kubernetes Grid (TKG). The server supported up to 47,150 concurrent Weathervane users (WvUsers) while meeting the workload's QoS requirements. With this kind of performance, the PowerEdge R750 running a VMware Kubernetes environment could allow organizations to consolidate application tiers from older servers and continue to meet critical service level agreements.

Our testing

A container is a unit of software packaged with everything required to run that software in a standalone state. Containers comprise everything an application needs to run, including binaries, libraries, dependencies, and of course, the application itself. Kubernetes is an open-source platform for deploying and managing applications that run in containerized environments.

We wanted to see how well the PowerEdge R750 could handle a VMware Kubernetes environment for a multi-tiered web app. To do so, we ran tests (more below) to determine the maximum WvUsers that the benchmark could simulate across multiple Weathervane instances simultaneously on a single TKG cluster while meeting QoS requirements. (Weathervane enforces three types of requirements: response times, operation mix, and failure percentage.)

We ran many configurations of TKG worker-node VMs and concurrent Weathervane instances. We used Weathervane's findMaxSingleRun run strategy parameter to find the maximum user count. This process would be similar to what an IT administrator would do to determine the optimal configuration for hosting any similar multi-tiered web app on a comparable PowerEdge R750 single-host TKG cluster. We determined that we had reached the appropriate number of TKG worker nodes and Weathervane application instances for our maximum user count test when we observed that CPU resources were approaching 100 percent utilization on the Dell EMC PowerEdge R750 we tested. See the science behind this report for a CPU utilization graph of our median test run.

After trying different combinations of users and number of instances, we determined that the PowerEdge R750 could support 47,150 WvUsers across 11 app instances running in 18 app-cluster worker nodes while meeting QoS requirements.

18
Tanzu Kubernetes Grid application cluster worker-node VMs

47,150
Weathervane users

11
Weathervane instances

Weathervane reports the maximum number of supported WvUsers per application instance. Figure 1 shows how many WvUsers each of our 11 application instances supported.

Users per app instance (higher is better)
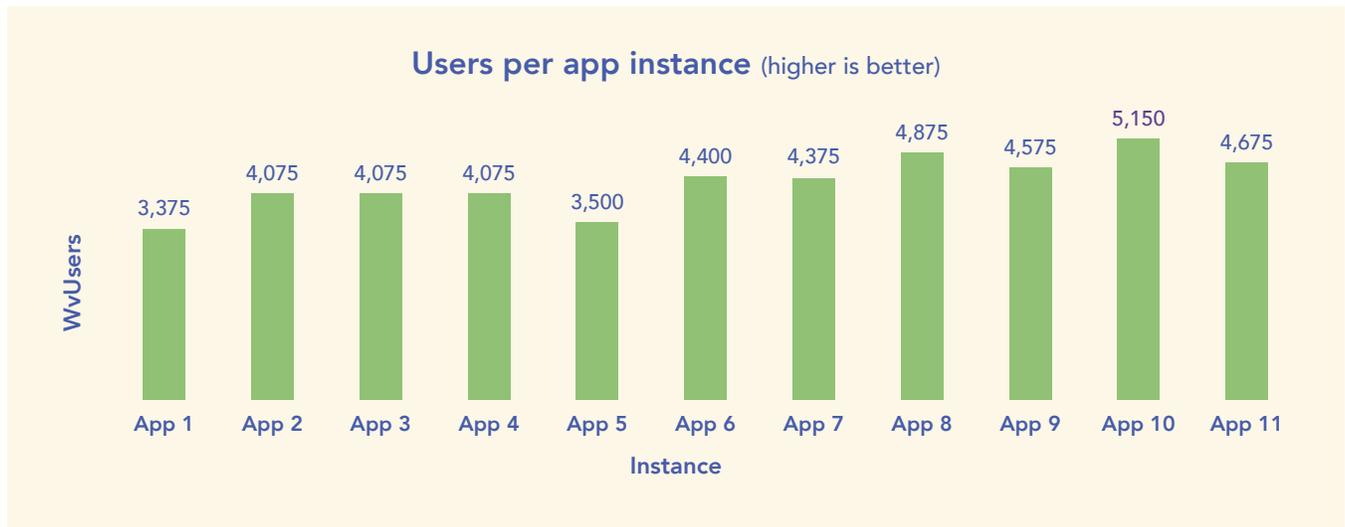
Figure 1: The maximum number of WvUsers that each of our 11 application instances supported in testing.
Source: Principled Technologies

About the Dell EMC PowerEdge R750

The Dell EMC PowerEdge R750 is a two-socket rack server powered by 3rd Generation Intel® Xeon® Scalable processors that fits into just 2U of rack space. The server supports up to 28 2.5-inch NVMe™ drives as well as Intel Optane™ Persistent Memory. In addition to Kubernetes containers and multi-tiered web apps, the PowerEdge R750 could support demanding workloads such as HPC, software-defined storage, and cloud applications.

To learn more about the advantages that the Dell EMC PowerEdge R750 offers, visit https://www.dell.com/en-us/work/shop/productdetailstxn/poweredge-r750.

Potential benefits for online auction sites, ecommerce, and similar multi-tiered web apps

Weathervane is a multi-tier web application that includes both stateless and stateful services. It simulates an online auction site, where thousands of users view products and information on items for sale and then place bids. For companies that run these kinds of sites, supporting a high volume of users is paramount for offering a positive user experience and yielding a high return.

With a single PowerEdge R750 running multiple app instances and supporting thousands of users, companies could seek to expand their business with a modest investment. Alternatively, companies could investigate web app workload consolidation, thus allowing older servers to support other workloads or application development. Companies running other kinds of multi-tiered web apps, such as those for ecommerce, could potentially support more users or generate more revenue with the PowerEdge R750 and a VMware Kubernetes environment.
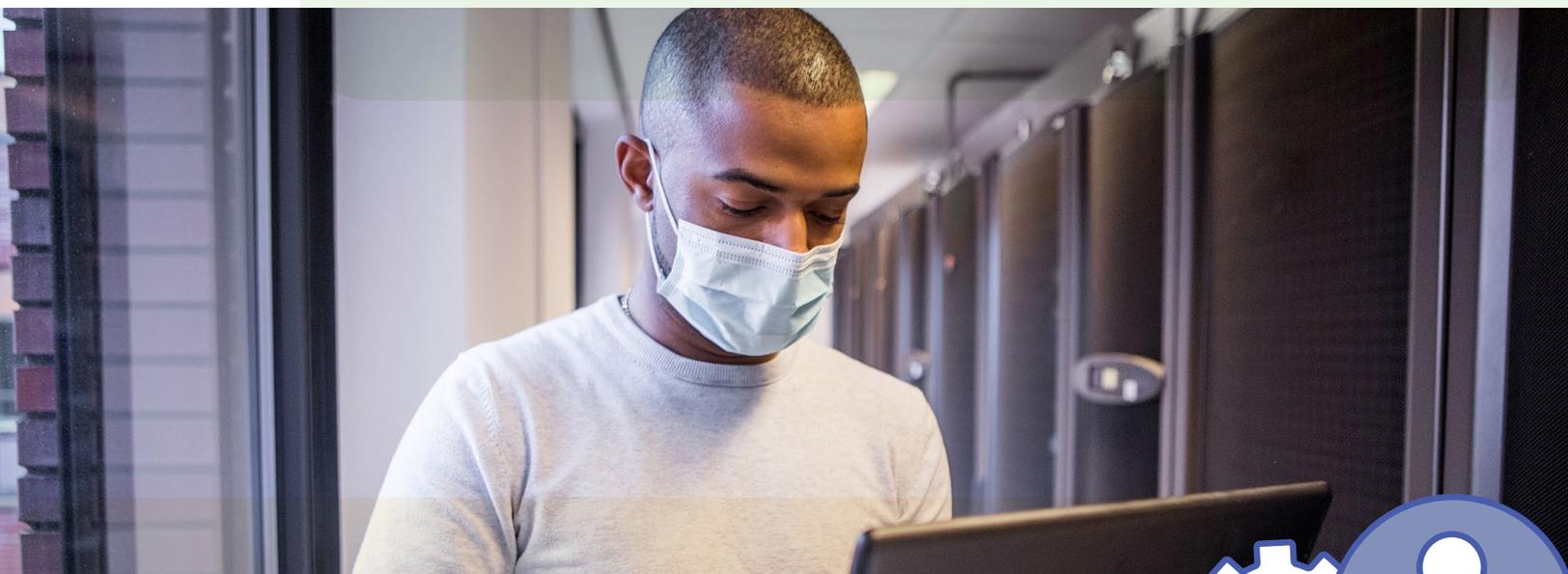
About VMware vSphere with Tanzu

To run our Weathervane workload, we used Tanzu Kubernetes Grid. VMware states that TKG is a "CNCF-certified, enterprise-ready Kubernetes runtime that streamlines operations across a multi-cloud infrastructure"[1] and also "provides a consistent, upstream-compatible implementation of Kubernetes, that is tested, signed, and supported by VMware."[2] TKG is part of the VMware Tanzu portfolio, which enables organizations to "build, run and manage modern apps on any cloud," as well as "simplify multi-cloud operations and free developers to move faster with easy access to the right resources," according to VMware.[3]

For more information, visit https://tanzu.vmware.com/tanzu.
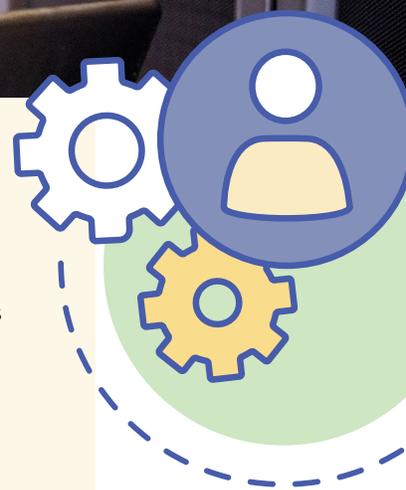
Conclusion

We ran a multi-tiered web app workload for Kubernetes on a Dell EMC PowerEdge R750 server with a VMware vSphere and VMware Tanzu Kubernetes Grid environment. In our tests, the server supported up to 47,150 concurrent WvUsers across 11 app instances while meeting the workload's QoS requirements. These results show that the PowerEdge R750 with a VMware Kubernetes environment can support resource-intensive multi-tiered web apps while still meeting critical service level agreements.

1. "VMware Tanzu Kubernetes Grid," accessed September 14, 2021, https://d1fto35gcfffzn.cloudfront.net/tanzu/tkg/TKG-Solution-Overview.pdf.

2. "VMware Tanzu Kubernetes Grid Documentation," accessed September 14, 2021, https://docs.vmware.com/en/VMware-Tanzu-Kubernetes-Grid/index.html.

3. "VMware Tanzu," accessed September 14, 2021, https://d1fto35gcfffzn.cloudfront.net/tanzu/VMware-Tanzu-Solution-Brief-0121.pdf.

Read the science behind this report at http://facts.pt/mzx4LWO ▶

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