



Technical Research Study

 PROWESS

Helping Customers Design and Bring to Market Solutions for Digital Content Creation and Delivery

Prowess Consulting determined that technology and solution providers for media and entertainment (M&E) can benefit from collaborating with Dell Technologies OEM Solutions and AMD.

 Dell Technologies

 AMD

Executive Summary

The success and proliferation of streaming services and broadband internet service has led to a new “Golden Age” of entertainment, from movies and television to music and games. As a result, the demand for 4K and 8K media content with engaging animation and realistic visual effects, in addition to immersive games, remains high. But greater demand means that media and entertainment (M&E) companies must produce and deliver content more quickly and reliably, or risk losing customers.

From the studio to the data center, M&E companies and content delivery network (CDN) providers require a reliable infrastructure that can deliver enhanced performance. In addition, they need to produce and provide content quickly while keeping costs contained. Technology and solutions providers for the M&E industry can benefit from partnering with Dell Technologies OEM Solutions to help design and optimize solutions for content creation and distribution, in addition to bringing those solutions to market faster. These designs can include customized solutions that meet the unique needs of M&E companies, and that make use of industry-leading infrastructure such as Dell PowerEdge servers and workstations powered by AMD® processors.

This paper provides an overview of content creation and delivery and presents an overview of how Dell Technologies OEM Solutions and AMD can help M&E companies and CDN providers optimize these value chains.

Content Creation and Delivery

Companies that produce and deliver content to consumers rely on not only streaming content such as existing movies, documentaries, and TV shows, but also creating new content that delights consumers and will keep them coming back for more.

When creating content, M&E companies typically follow a general workflow that includes content production, content preparation, and content delivery.



Figure 1. Content creators follow a basic content-creation and delivery workflow to provide content to consumers

Content Production and Preparation

Whether content includes live news broadcasts, summer blockbusters, or the latest hit streaming TV series, content production is vital to keeping media consumers engaged and entertained.

Modern content production includes many moving parts, from script production to visual and special effects creation to cinematography. Typical content-production workflows include:

- Pre-visualization
- Rapid rendering
- Virtual cameras
- Filming with digital cameras



Once content creators have filmed scenes, the video is then moved to post-production. Content creators use various software editing tools to combine video footage with the following:

- Visual effects (VFX)
- Special effects (SFX)
- Sound re-recording/mixing
- Color grading
- Closed captioning and subtitles

Once content creators combine all of the various film and audio elements, film editors work with directors to digitally edit the content into a final, completed product. Post-production specialists then encode the content into digital video formats and package them for distribution.

Each of these steps often requires powerful, custom-designed workstations and server systems, such as those provided by Dell Technologies and AMD, to accomplish the content creators' goals. Dell Technologies can help M&E companies design custom AMD processor-powered solutions that can help accelerate content production and preparation.

CDNs

Once encoded and packaged, content then moves out of the studio and into the content-delivery channel. Having grown in popularity, streaming services deliver digital media directly to consumers through digital devices such as smart TVs, smartphones, and computers. Studios deliver digital media using CDNs that stream media to consumers through broadband internet connections.

CDNs are the backbone of streaming services. During the internet's early days, content would often reside on single servers hosted in a variety of locations, from highly regulated data centers to office closets with spotty internet connections and carpet that was prone to generating damaging static electricity. When a consumer used a desktop or laptop computer to request content—usually static text and low-resolution images—from a server, the content had to travel over multiple networks and routers to reach the consumer's computer. Multiple network hops introduced congestion and latency that would slow down content delivery. Distance also introduced latency, as content servers and the consumers could be separated by thousands of miles across continents.

Content consumers were much more forgiving of delays in the early days of the internet, but all of that has changed. Today's content consumers expect instant access to vast arrays of content, from movies and television to gaming and music on devices that range from smartphones with small screens to dedicated gaming consoles with large 4K or 8K displays. The latency tolerated by early internet users is no longer acceptable to today's content consumers.

The key to improving the content-consumer experience is to place content as close to the consumer as possible. The basic function of a CDN is to manage and deliver content from studios to consumers quickly and efficiently with as few delays as possible. CDNs must be built for high availability, reliability, low latency, and performance.

M&E and CDN companies often design CDNs around a hub-and-spoke model, which achieves multiple goals:

1. Make it easy for M&E companies to manage content
2. Place content closer to consumers, which reduces latency and improves the consumer experience
3. Provide the ability to scale the CDN to accommodate more streams and more content consumers

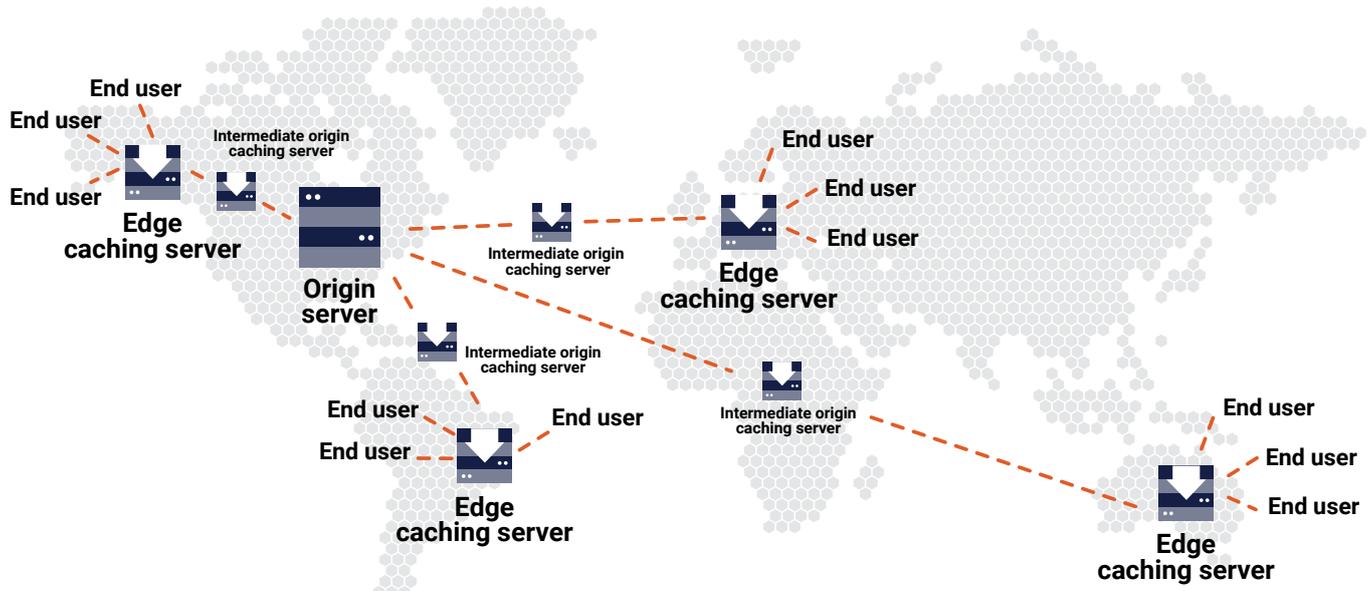


Figure 2. CDNs distribute content from central and intermediate origin servers to edge caching servers located close to content consumers

The hub, or origin server, is where M&E companies upload content that is distributed throughout the network. Hubs consist of devices such as Dell PowerEdge servers and storage deployed in data centers whose central locations—often in urban areas—provide access to multiple high-bandwidth carrier networks. These networks help the origin server systems push content to intermediate origin servers or edge caching servers.

Intermediate origin and edge caching servers reside in data centers that are closer to the internet service provider (ISP) networks that consumers use to receive content. Edge caching servers can reside in smaller edge data centers that have direct connections to ISP or telecommunications companies' (telcos') networks, or they can reside directly in an ISP's or telco's own data centers.

When a content consumer requests an episode of their favorite TV show through an app on their digital device, the CDN determines the shortest path from the consumer's device to an available edge caching server. The network then streams content from the closest edge caching server to the consumer's device, varying the resolution or bitrate depending on the device's screen size and bandwidth. As the CDN delivers content to a consumer's device, the user expects the content to be delivered in the highest possible quality. The CDN applies encoding to the content stream that can reduce the amount of bandwidth required but still provide a quality experience.

CDNs will often encode multiple versions of the same content to address the specific needs of differing end user device formats. Encoding multiple versions achieves two purposes:

1. It tailors the stream to the consumer's device and bandwidth, which can help improve the consumer experience.
2. It reduces the bandwidth required from the edge caching server, edge data center, and the consumer's ISP.

A CDN might encode content at different resolutions or bitrates. The CDN can then send whatever version of the content is most suitable for the consumer's device and the available bandwidth from the consumer's internet connection. For example, a CDN can stream a lower-resolution version of a movie to a consumer's smartphone due to the lower resolution of the screen, while simultaneously streaming a 4K resolution version of the same movie to another consumer's 4K smart TV.

Getting content as close as possible to consumers and delivering the highest quality streams can be challenging in that the servers that stream the content might reside outside of traditional data centers, such as in remote locations that lack the stringent environmental controls found in larger data centers. M&E and CDN companies often know how they want these servers configured for specific workloads, but they might not have the expertise for designing and optimizing the servers mechanically, thermally, and electronically for deployment in harsher edge environments. That's why Dell Technologies can help M&E and CDN companies overcome the challenges of designing systems that operate in more extreme environments, which can help these companies focus on content, not technology infrastructure.

M&E Companies Require Powerful Technology Infrastructure to Deliver Content to Audiences Quickly and Efficiently

Editing and processing raw or compressed video footage and then encoding and delivering the final product pushes workstations and servers to their limits. Dell provides innovative products powered by AMD processors to M&E and CDN companies. In addition, Dell Technologies OEM Solutions provides a suite of unique OEM capabilities and technology offerings, including custom products, to companies designing solutions in this space. These custom solutions can help accelerate the entire content creation and delivery pipeline, and they are tailored to the unique needs of the M&E industry. With more than 20 years of experience, Dell Technologies OEM Solutions has helped customers design products and solutions for more than 40 industries.¹

From custom-built video editing and VFX workstations to rugged edge caching servers, Dell Technologies OEM Solutions works with M&E and CDN companies and their technology suppliers to navigate the complexity of designing, validating, fulfilling, and supporting these custom solutions.

Dell Precision 7865 Tower Features AMD Ryzen™ Threadripper™ PRO Processors

Content creators are always looking for the fastest workstations possible. Faster workstations equal faster rendering, game development, and post-production. The Dell Precision 7865 tower features AMD Ryzen Threadripper PRO 5000 WX-Series processors, which come with up to 64 CPU cores, 56 TB of storage, and professional graphics options that can help content creators accelerate their workflows. The workstation also features enhanced venting and acoustic performance, meaning customers can focus on work while the system runs smoothly and quietly.²

Solution Planning and Management

The M&E landscape is constantly changing as new technologies enable more creativity and distribution options. These changes require companies to adapt quickly to the evolving needs of content creation and distribution. Dell Technologies OEM Solutions and AMD help technology and solution providers for the M&E industry innovate faster by integrating industry-specific hardware and software requirements with custom-engineered solutions. As a partner, Dell Technologies OEM Solutions can help M&E companies augment internal system design staff and provide constant communication between teams to deliver guidance from idea inception to product delivery.

Dell Technologies OEM Solutions and AMD help technology and solution providers for the M&E industry innovate faster by integrating industry-specific hardware and software requirements with custom-engineered solutions.

Roll-Out Ready Designs and Custom-Engineered Solutions

Dell Technologies OEM Solutions works with customers to accommodate their unique requirements and provide engineering expertise across a wide range of needs, including:

- **Standard off-the-shelf designs:** Dell Technologies OEM Solutions offers global access to leading industry-standard technology such as Dell PowerEdge servers and Dell Precision workstations.
- **OEM unique:** M&E companies can buy off-the-shelf OEM-ready products such as de-branded or rebrand-ready products. Customers can add custom logos, splash screens, BIOS, bezels, packaging, documentation, and more to these products. For product offerings that require a longer lifespan, Dell Technologies OEM Solutions can offer select OEM XL and XE solutions that provide fewer disruptions, higher longevity, and higher visibility for future planned upgrades. Dell Technologies OEM Solutions can also accommodate demanding environments at the edge, outside of data centers, with ruggedized solutions that use robust and hardened chassis designs, extended environmental specifications, longer lifespans, and smaller footprints.³
- **OEM custom:** If M&E companies require more than what standard technologies provide, they can collaborate with Dell Technologies OEM Solutions technology and engineering experts to design custom solutions.

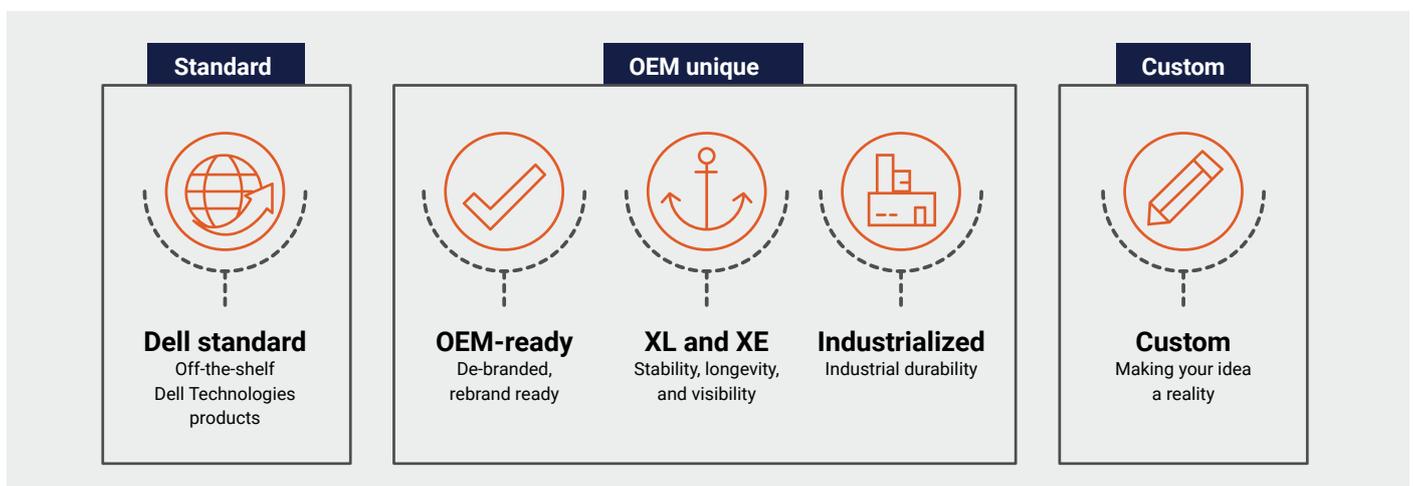


Figure 3. Dell Technologies OEM Solutions can help M&E companies design solutions with an array of custom-engineered solutions

As part of its OEM unique service, Dell Technologies OEM Solutions can provide custom-engineered, AMD processor-powered products that unify hardware and software to produce a customized solution. For example, M&E companies or streaming services that provide custom data center equipment to telecom companies or ISPs as part of a CDN can benefit from:

- Customized brand-specific bezels and chassis with textured finishes
- Unique badges and colors
- Branded splash screens
- Individualized BIOS, Integrated Dell Remote Access Controller (iDRAC), and security settings
- Validation and installation of non-standard PCIe® add-in cards such as network interface controllers (NICs), field-programmable gate arrays (FPGAs), or graphics processing unit (GPU) accelerator cards
- Custom brackets, cabling, backplanes, heat sinks, risers, wall mounts, and chassis sheet metal
- Regulatory certifications and validation
- Tailored operating system (OS) updates

Dell Technologies OEM Solutions can also provide more in-depth system ruggedization in instances where equipment resides in harsher edge environments.

Supply-Chain Management and Full Support for Custom Solutions

Sourcing custom technology parts and providing system support for custom solutions can be challenging for non-technology companies. Dell Technologies OEM Solutions provides full supply-chain management (SCM) and support for custom solutions, which helps M&E and CDN companies focus on their core business and competitive differentiation, while leaving infrastructure complexity to Dell Technologies OEM Solutions.

A fully managed, secure supply chain is crucial to ensuring M&E companies have the parts they need, when they need them, for their custom solutions. Dell Technologies OEM Solutions brings decades of experience in SCM and support for M&E companies. Dell Technologies OEM Solutions works with parts suppliers to help maintain access to critical parts, and it operates a network of manufacturing facilities around the world.

Custom Dell Technologies OEM Solutions Powered by AMD® Processors

When designing custom solutions for content creation and delivery, M&E companies must carefully consider how much performance and what capabilities CPUs can offer in the most density- and power-efficient packaging available. Computer-generated imagery (CGI) rendering, audio/video encoding and transcoding, and streaming all require high levels of performance from CPUs. AMD provides a wide range of server CPUs that can combine industry-leading core counts, per-core performance, and energy efficiency depending on needs.

AMD EPYC™ Processors

The AMD EPYC™ processor family can help accelerate media workloads in studios, data centers, and at the edge. These processors provide high densities and exceptional overall performance by:

- Delivering superior rendering capabilities, which let content creators produce projects faster. For example, a dual-socket AMD EPYC 7763 processor–powered server provided up to 55 percent better rendering performance than a dual-socket Intel® Xeon® Platinum 8380 processor–based server in Blender and LuxCoreRender.⁴
- Encoding video faster, which enables quicker streaming from fewer edge caching servers. For example, a dual-socket AMD EPYC 75F3 processor–powered server provided 1.20x the video encoding performance versus a dual-socket Intel Xeon Platinum 8380 processor–based server.⁵
- Helping M&E companies meet environmental goals with leadership energy efficiency.⁶
- Helping reduce total cost of ownership (TCO).

AMD EPYC 7003 processors provide up to 64 cores and 128 threads, in addition to support for up to 4 TB of memory per socket. Additionally, AMD EPYC 7003 Series processors with AMD 3D V-Cache™ triple the amount of L3 cache memory, from 256 MB on standard AMD EPYC 7003 Series CPUs to 768 MB, by using true 3D die stacking, which helps increase overall performance on select workloads. For more information about specific AMD EPYC 7003 Series processors, see the [AMD EPYC 7003 Series datasheet](#).

Well-Balanced Server Solutions for Content Creation and Distribution

Dell Technologies OEM Solutions specializes in well-balanced server systems that are optimized for content creation and distribution. A well-balanced system combines optimized network-adaptor support and high-performance AMD CPUs with memory and fast solid-state drive (SSD) storage to create systems that can handle more content streams or rendering processes in a smaller package. In a single socket AMD EPYC processor–powered server with higher core counts, Dell Technologies OEM Solutions can optimize the system with no cross-socket non-uniform memory access (NUMA) latency, while offering PCIe Gen4 (with PCIe Gen5 on the horizon) and 100 gigabit Ethernet (GbE) networking that reduces component bottlenecks.

Two-socket systems increase core-count capabilities to allow more throughput and concurrent streaming sessions per server. At edge data center locations, CDN or M&E companies pay for space, so they can reduce the number of servers required to service content consumers. Fewer servers and a smaller data center footprint mean lower power and cooling costs, enabling more energy-efficient deployment scenarios.

Dell Technologies OEM Solutions can provide M&E companies and CDN providers with one- and two-socket AMD processor-powered OEM-ready and standard server solutions, as listed in Table 1 and Table 2.

Table 1. Single-socket Dell PowerEdge servers powered by AMD EPYC™ processors are customizable in both branded and de-branded configurations

Single-Socket AMD EPYC™ Processor-Powered Rack Servers	Key Capabilities	OEM-Ready
Dell PowerEdge R6515	<ul style="list-style-type: none"> 1U rack design Up to 1 TB of DDR4 RDIMM or 2 TB LRDIMM memory, and up to 3,200 megatransfers per second (MT/s) Up to 10 NVM Express® (NVMe®)-direct SSDs Up to 1 PCIe® Gen3 and 1 PCIe® Gen4 slot 	Yes
Dell PowerEdge R7515	<ul style="list-style-type: none"> 2U rack design Up to 1 TB of DDR4 RDIMM or 2 TB LRDIMM memory, and up to 3,200 MT/s Up to 24 NVM Express® (NVMe®) SSDs with up to 12 NVMe® direct 	Yes



Table 2. Dual-socket and modular Dell PowerEdge servers powered by AMD EPYC™ processors are customizable in both branded and de-branded configurations

Dual-Socket AMD EPYC™ Processor-Powered Rack Servers	Key Capabilities	OEM-Ready
Dell PowerEdge R6525	<ul style="list-style-type: none"> 1U rack design Up to 2 TB of DDR4 RDIMM or 4 TB of LRDIMM memory, and up to 3,200 MT/s Up to 12 (10+2) NVM Express® (NVMe®)-direct SSDs Up to two full-height, three-quarter length GPUs at 150 watts each 	Yes
Dell PowerEdge R7525	<ul style="list-style-type: none"> 2U rack design Up to 128 CPU cores Up to eight PCIe® Gen4 slots Accommodates up to six single-wide GPUs or accelerators Up to 2 TB of DDR4 RDIMM or 4 TB of LRDIMM memory, and up to 3,200 MT/s Up to 24 NVMe® 2.5" Serial-Attached SCSI (SAS)/Serial ATA (SATA®)/NVMe® SSD drives or up to 12 3.5" SAS/SATA® hard-disk drives (HDDs) 	Yes
Dell PowerEdge C6525	<ul style="list-style-type: none"> Modular server with up to four systems in a 2U rack design Up to 2 TB of DDR4 RDIMM or 2 TB of LRDIMM memory, and up to 3,200 MT/s Two PCIe® x16 Gen4 risers, one PCIe® x8 Gen3 M.2 riser, and one OCP 3.0 x16 Gen4 slot 	No
Dell PowerEdge XE8545	<ul style="list-style-type: none"> 4U rack design Optimized CPU and GPU performance One PCIe® x16 Gen4 low-profile slot, one PCIe® x16 Gen4 full-height slot, and one PCIe® x16 Gen4 full-height or two PCIe® x8 Gen4 full-height slots Up to 10 2.5" hot-plug SAS/SATA® HDDs or SSDs and 8 NVMe® SSDs 	No



Dell Technologies OEM Solutions Can Help M&E Companies Design Custom AMD Processor–Powered Solutions

Prowess Consulting determined that Dell Technologies OEM Solutions can help M&E solution builders and CDN providers design and optimize solutions for content creation and delivery with AMD CPU–powered servers and workstations. Dell Technologies OEM Solutions, along with AMD, works with M&E and CDN customers to help understand their needs and requirements and build solutions with either standard off-the-shelf solutions or custom products. Partnering with Dell Technologies OEM Solutions can help M&E companies bring their solutions to market faster while avoiding the headaches of designing hardware and supporting infrastructure in-house.

To learn more about Dell Technologies OEM Solutions, visit [Dell.com/OEM](https://www.dell.com/oem).



¹ Dell Technologies. "Build innovative designs and realize your solution's full potential." Accessed September 2022. www.dell.com/en-us/dt/oem/index.htm

² Dell Technologies. "Precision 7865. Power your productivity." www.delltechnologies.com/asset/en-us/products/workstations/technical-support/precision-7865-spec-sheet.pdf

³ Some Dell Technologies OEM Solutions product offerings, such as OEM XL and XE or ruggedized servers, are not available for Dell products that are based on AMD® processors as of September 2022.

⁴ Source: AMD. "AMD EPYC™ Family of Processors Claim Information." www.amd.com/en/claims/epyc#faq-MLN-156. Claim: MLN-156: Renderer Tests (Blender and Lux Core Renderer) geometric mean comparison based on Phoronix Test Suite independent testing at openbenchmarking.org as of 08/30/2021. Configurations: 2x AMD EPYC 7763 (geometric mean=64.09) versus 2x Intel Xeon Platinum 8380 (geometric mean=41.41) for 1.55x the renderer performance. See <https://openbenchmarking.org/result/2108309-IB-2104280IB93> for details.

⁵ Source: AMD. "AMD EPYC™ Family of Processors Claim Information." www.amd.com/en/claims/epyc#faq-MLN-157. Claim: MLN-157: Video Encoding (kvazaar and avifenc) geometric mean comparison based on Phoronix Test Suite independent testing at openbenchmarking.org as of 08/30/2021. Configurations: 2x AMD EPYC 75F3 (geometric mean=93.47) versus 2x Intel Xeon Platinum 8380 (geometric mean=77.8) for 1.20x the video encoding performance. See <https://openbenchmarking.org/result/2108309-IB-2104280IB93> for details.

⁶ As of 2/2/22, of SPECpower_ssj® 2008 results published on SPEC's website, the 55 publications with the highest overall efficiency results were all powered by AMD EPYC processors. More information about SPEC® is available at www.spec.org. SPEC and SPECpower are registered trademarks of the Standard Performance Evaluation Corporation. For details, see: AMD. "AMD EPYC™ Family Claim Information." www.amd.com/en/claims/epyc3x#faq-EPYC-028. Claim: EPYC-028A.



The analysis in this document was done by Prowess Consulting and commissioned by Dell Technologies.

Prowess and the Prowess logo are trademarks of Prowess Consulting, LLC.

AMD, the AMD Arrow logo, EPYC, Threadripper, Ryzen, 3D V-Cache and combinations thereof are trademarks of Advanced Micro Devices, Inc.

Copyright © 2022 Prowess Consulting, LLC. All rights reserved.

Other trademarks are the property of their respective owners.