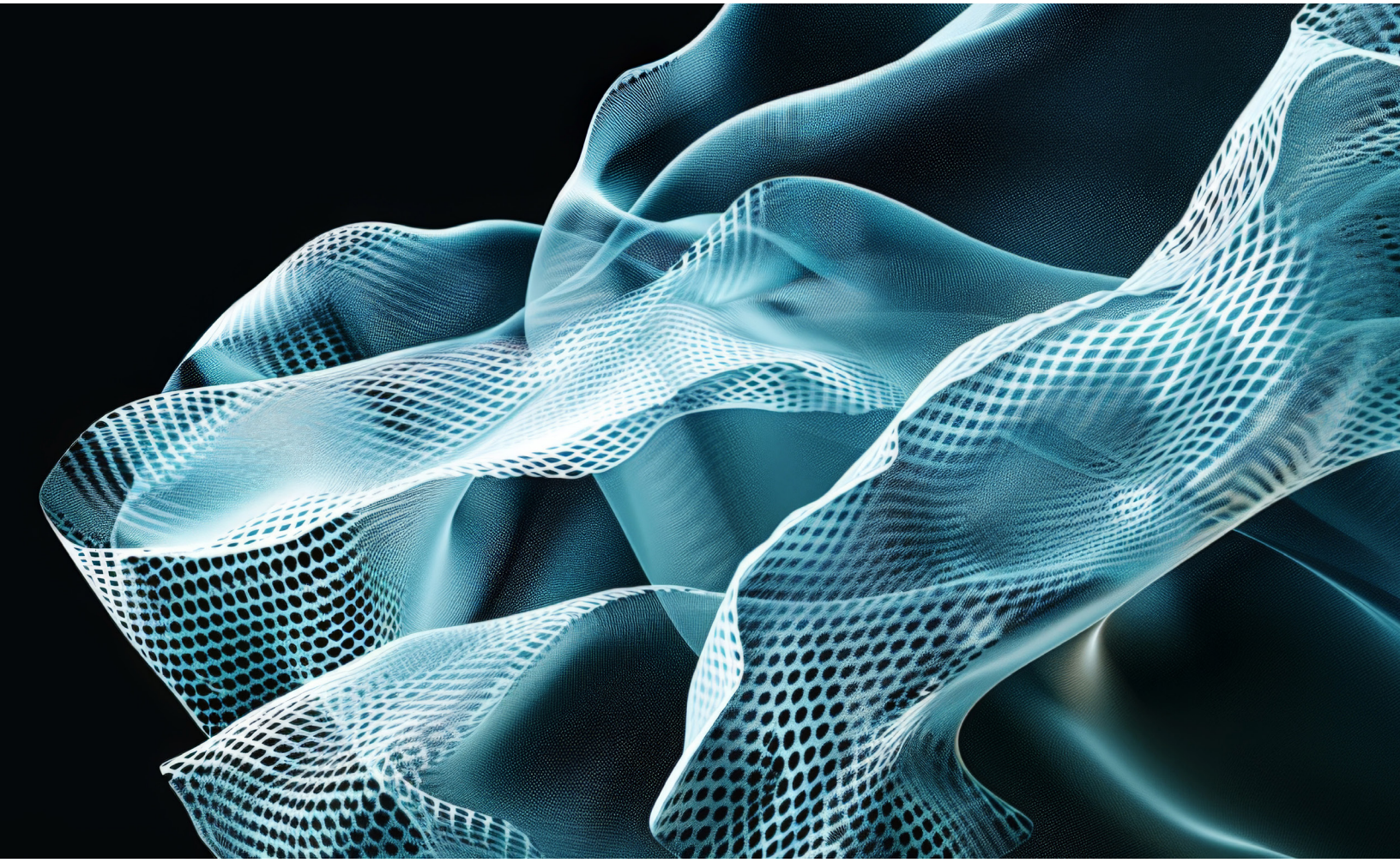


AMD, HPE & Secure64 TECHNICAL WHITE PAPER:

Enhanced Performance and Energy Efficiency of Secure64® DNS Cache on HPE ProLiant DL325 Gen11 Servers with 5th Gen AMD EPYC™ 9555 Processors

CONTENTS

Executive summary 3

Objective and scope 3

Performance results 4-5

HPE server specifications 5-6

The Importance of DNS to network operations and security –
why performance, energy efficiency and cost savings are needed today 5-8

Conclusions 9

EXECUTIVE SUMMARY

In an era where DNS performance, energy efficiency, and sustainability are top priorities for carriers and service providers, Secure64 and AMD have partnered to deliver a powerful, future-ready solution. By deploying Secure64 DNS Cache on HPE ProLiant DL325 Gen11 servers powered by 5th Gen AMD EPYC™ 9555 processors, organizations can achieve nearly 5X DNS performance over legacy solutions while helping reduce power consumption.

This joint solution addresses the dual challenge of increasing DNS traffic and rising operational costs. With AMD EPYC CPU's core density, power efficiency, and advanced security features, customers can consolidate infrastructure leading to lower cooling and energy costs and build resilient DNS architectures capable of addressing today's flash events, DDoS attacks, and tomorrow's scale demands. Whether optimizing for cost, energy efficiency, or performance, this collaboration enables measurable outcome possibilities:

- Fewer servers required for the same DNS load
- Lower power and cooling costs
- Greater resilience and scalability
- Compliance-ready infrastructure for emerging environmental regulations

Secure64, AMD and HPE together empower network operators to meet modern DNS demands with smart, energy efficient infrastructure – without compromise.

OBJECTIVE AND SCOPE

Secure64 Software Corporation, in collaboration with AMD and HPE, tested the significant performance improvements and energy efficiency (power savings) observed when running Secure64 DNS Cache on the AMD 5th Generation and the HPE ProLiant DL325 Gen11 server. This processor offers distinct advantages in performance and power savings compared to previous generations and competitor offerings.

The Domain Name System (DNS) is the foundation of today's digital landscape, but its ubiquity also means it is a part of the growing energy footprint of servers and data centers across the globe. Secure64 DNS solutions, when combined with AMD EPYC™ processors and HPE ProLiant Gen11 servers, enable outstanding energy efficiency per server while at the same time delivering a4.3X improvement in performance.

Secure64 is a leading provider of carrier-grade secure DNS solutions, offering, high-performance and secure DNS server software, DDoS protection, malware and fraud protection, DNS tunnelling protection and content filtering. Secure64 software can run on bare metal, virtual or on containers.

AMD EPYC™ processors are known for their high performance, scalability, and advanced security features, making them an ideal platform for demanding workloads.

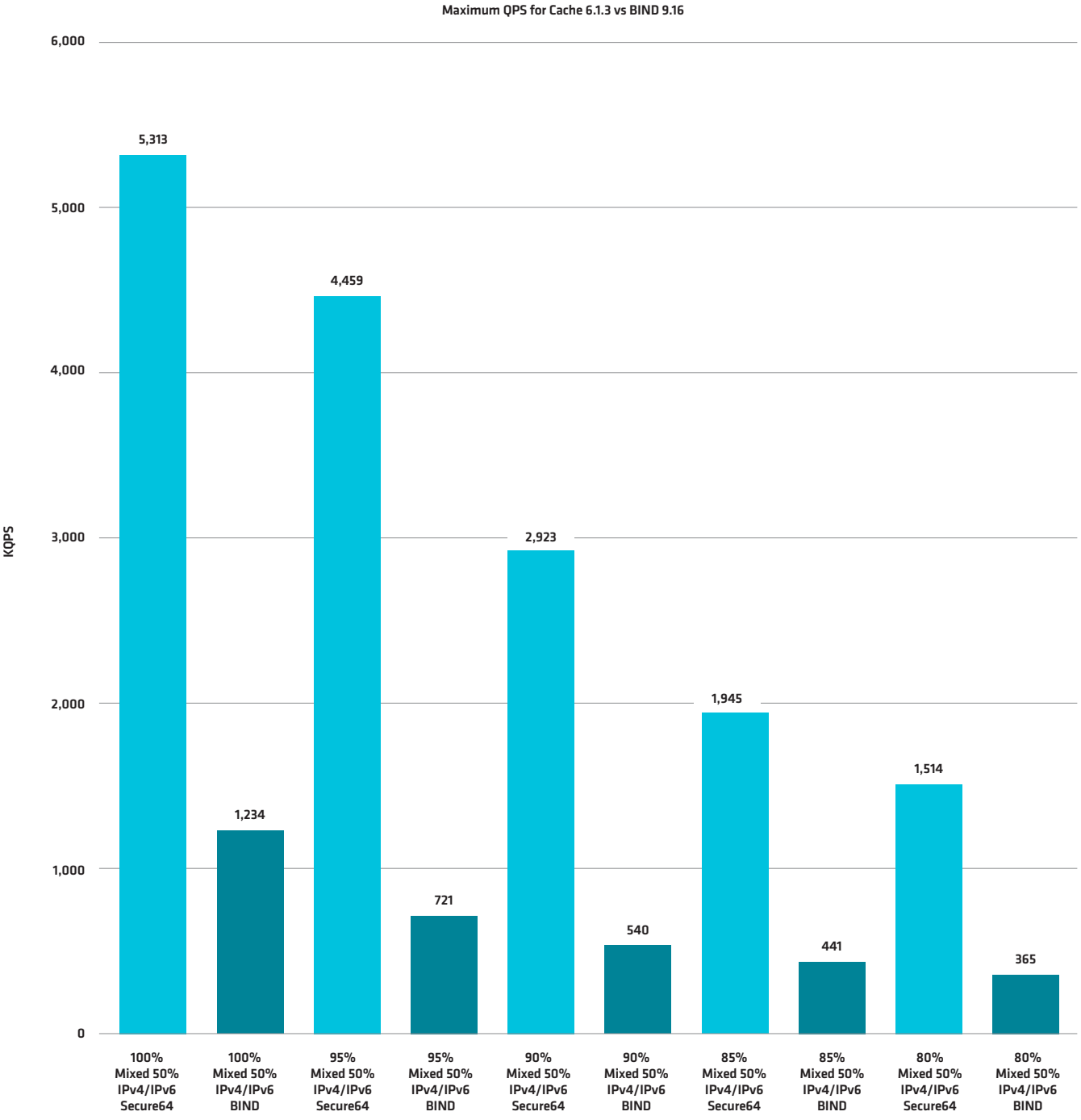
For telcos and operators of large networks the exceptional performance of the DNS combined with power savings is significant and compelling at a time when power grids, power costs and server workloads are facing significant challenges.

HPE provided a DL325 ProLiant Gen11 server with 5th Generation AMD EPYC™ 9555 processor for performance testing (Test Specifications and Configuration information provided below).

Secure64 performed performance testing and AMD performed power efficiency testing.

Secure64 DNS runs on Oracle Enterprise Linux and Red Hat Linux, version 9.4 or above. Red Hat Linux version 9.4 was used in these tests.

PERFORMANCE RESULTS



The results compare Secure64 DNS Cache 6.1.3 with the commonly used BIND DNS software on the same hardware and using the same lab environment to minimize variables.

Secure64 DNS can also be deployed virtually or on containers.

CONCLUSION

As shown in the graph, Secure64 Cache DNS On HPE ProLiant DL325 Gen11 Servers with AMD EPYC 9555 5th Generation Processors & Red Hat provides over 4.3X improvement in performance over BIND DNS depending upon the cache hit or miss ratio. Most internet traffic results in a 95% hit (or cached response) ratio which has an over 6X performance improvement with Secure64.

This insures significant headroom to respond to DDoS attacks, flash crowds, network configuration errors, and future proofs for additional security and real time reporting requirements.

WHAT IS Secure64 DNS CACHE?

Secure64 DNS Cache is a DNS resolver, also known as a recursive DNS server, it translates domain names (like “example.com”) into IP addresses (like 93.184.216.34), acting as an intermediary between a client and the broader DNS system.

When you type a website address into your browser, the DNS resolver is the first server contacted to find the corresponding IP address. It then queries other DNS servers (root servers, top-level domain servers, and authoritative servers) to find the IP address. Once it obtains the IP address, it sends it back to the client. The resolver also caches the results of previous queries to speed up future lookups.

These queries are cached for a period of time known as a time to live or TTL. When multiple user requests are received within that time (for example, looking up AMD.com) the lookup is considered a cache hit. It takes less time to respond to cache hits. The percentages in the graph show the performance from 100% cache hits to 80% cache hits. Normal DNS traffic usually exceeds 80% cache hits.

Secure64 performance on the latest AMD Gen 5 powered HPE ProLiant DL325 Gen 11 servers provide over 4.3x higher performance enables server consolidation, power savings, and headroom for flash events Like flash crowds, router or other network misconfigurations and denial of service attacks.

Test Specifications

	ITEM	DESCRIPTION
HW Configuration	Server	HPE ProLiant DL325 Gen11
	Processor	1 x AMD EPYC™ 9555 (5th Gen.)
	Core Freq.: Base | Boost	3.0 GHz | 4.0 GHz (Max)
	Cores	64 Cores/Socket (128 Threads)
	Caches	L1 Cache: 5120K L2 Cache: 65536K L3 Cache: 262144K
	Memory	384 GB DDR5-4800 (12 x 32GB DIMMs)
	Storage	2 × 480GB 2.5" SSD/NVMe (RAID 1)
	Network	Red Hat Enterprise Linux 9.4
Linux OS	Linux OS	Red Hat Enterprise Linux 9.4
	Kernel	
SW Configuration	DNS Software	Secure64 DNS Cache 6.1.3
	DNS.CONF file settings	60 threads (limit) 100% IPv6 Queries per thread: 4096 rrset-Cache-Size: lg msg-cache-slabs: 64 rr-cache-slabs: 64

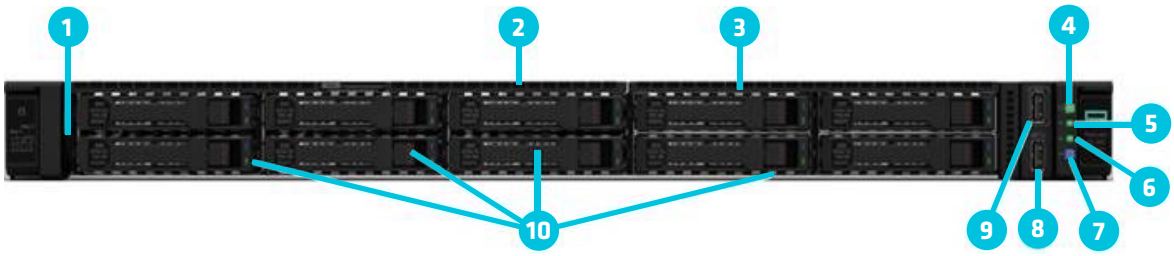
SERVER UNDER BENCHMARK	DNS .CONF FILE SETTINGS		
AMD CPU: EPYC 9555, 5th Generation	2	0	60 threads (limit)
Max Cores 64		0	100% IPv6
LI Cache 5120K		0	Queries per thread 4096
L2 Cache 65536K		0	rrset-Cache-Size lg
L3 Cache 262144K		0	msg-cache-slabs 64
DIMM DDR 5 384 GB RAM		0	rr-cache-slabs 64
Ethernet 10/25Gb 2port SFP28			

For > one million QPS at 85% Cache Hit Ratio, Secure64 recommends EPYC 9535, 9575F or 9555 CPU.

HPE PROLIANT DL325 Gen11

Are you looking for a scalable, low-cost performance server solution for your virtualized and software-defined compute workloads?

The HPE ProLiant DL325 Gen11 server is a low-cost 1U 1P solution that delivers exceptional value balancing compute, memory, and network bandwidth at 1P economics. Powered by 4th and 5th Generation AMD EPYC™ Processors with up to 160 cores, increased memory bandwidth (up to 3 TB), high-speed PCIe Gen5 I/O and EDSFF storage, and supporting up to 2 double-width GPUs at the front, this server is a superb low-cost, 1U 1P, performance solution for your virtualized workloads. The silicon root of trust anchors the server firmware, creating a fingerprint for the AMD Secure Processor that must be matched exactly before the server boot. The HPE ProLiant DL325 Gen11 server is an excellent choice for virtualized workloads such as software-defined compute, CDN, VDI, and secure edge apps that require balancing processor, memory, and network bandwidth.



Front View - 8 SFF + optional 2 SFF Drive Bay shown

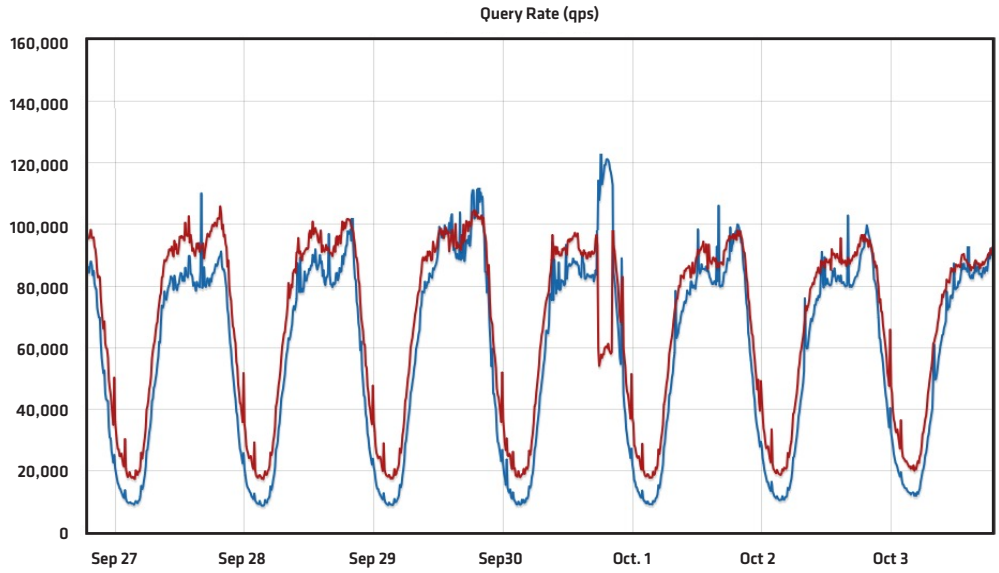
1. Serial number pull tab
2. Quick removal access panel
3. 2 SFF Cage Bay (Optional - shown) 1
4. Power On/Standby button and system power LED
5. Health LED
6. NIC status LED 2
7. Unit ID button/ LED
8. USB 3.2 Gen1 port
9. iLO Service Port
10. 8 SFF Cage Bay

ENERGY EFFICIENCY IN DNS SOLUTIONS

DNS is a critical component of Internet infrastructure, translating human-readable domain names into network addresses and other information that enable modern communication.

Data centers, which house DNS servers, consume significant amounts of electricity. According to the U.S. Department of Energy,[1] data centers accounted for about 4.4% of US and 1.3% of global electricity consumption in 2024, and this figure is expected to rise as internet usage and AI requirements expand.

Unlike many compute workloads, DNS has regular, daily cycles of high and low demand. DNS deployments must provision for peak loads. AMD's power saving features combined with performance reduce the cost of this provisioning. This illustration of two servers in a typical data center shows this behavior:



With this usage pattern, DNS is uniquely positioned to leverage power-saving mechanisms normally applied to workloads like LLM processing and cryptocurrency mining. The potential benefits include cost savings, energy efficiency, and performance optimization.

1. https://eta-publications.lbl.gov/sites/default/files/2024-12/lbnl-2024-united-states-data-center-energy-usage-report.pdf

AMD EPYC™ PROCESSORS POWER EFFICIENCY

AMD EPYC™ processors offer exceptional performance and power efficiency, making them a top choice for data centers and high-performance computing applications. EPYC processors leverage a high core count architecture, offering up to 192 cores per socket, which significantly boosts parallel processing capabilities and overall computational power.

This high core density, combined with advanced features like PCIe Gen5 support, DDR5 memory, and a strong focus on energy efficiency, enables AMD EPYC™ processors to deliver top-tier performance while minimizing power consumption. These processors are also designed with advanced energy-efficient technologies, such as dynamic power management and fine-tuned power consumption optimization, that can significantly reduce the energy footprint of DNS servers.

Cost Savings

Energy-efficient DNS solutions can reduce the power consumption of data centers, leading to lower operational costs. In addition to reducing power costs, optimizing power consumption can mean less need for cooling, another serious consideration for data centers. Optimizing energy costs directly translates into both on-going operating savings and deferred or avoided capital expenditures for businesses. Over time, these savings can be substantial, especially for large-scale operations managing high volumes of DNS queries.

System Efficiency

Efficient systems often employ advanced technologies and algorithms to optimize resource use without compromising speed or reliability. Energy-efficient hardware components, such as low-power processors and solid-state drives (SSDs), can handle DNS queries more swiftly and with less energy compared to traditional hardware. Intelligent load balancing and dynamic resource allocation can enable DNS servers to operate at optimal efficiency, adjusting power use according to demand. This results in enhanced query resolution times and overall performance.

Energy Efficiency and Future-readying

Adopting energy-efficient DNS solutions is also a step towards energy efficiency and future-readying IT infrastructure. As global energy prices fluctuate and regulatory pressure to reduce carbon emissions increases, businesses that have already invested in energy-efficient solutions will be better positioned to adapt to these changes.

Sustainability, climate, and greenhouse gas emissions disclosure rules have been issued by the EU (CSRD), the US SEC, and the state of California, among others. Secure64 running on HPE ProLiant DL325 (and DL345) Gen11 servers with AMD EPYC™ processors deliver power and cooling savings alongside high performance and security features for DNS, offering cost savings while addressing sustainability and regulatory goals for customers.

Sustainable practices in IT can also set the stage for certifications and compliance with international standards, further enhancing a company's reputation and marketability. Future-readying through energy efficiency helps ensure that DNS solutions remain viable and cost-effective in the long term, adapting to evolving technological and environmental landscapes.

Achieving Energy Efficiency in DNS Solutions

Achieving energy efficiency in DNS solutions involves a combination of hardware, software, and strategic practices. Here are some key approaches:

1. Energy-Efficient Hardware: HPE ProLiant DL325 (and DL345) Gen11 servers with energy-efficient AMD EPYC™ processors, memory, and storage devices coupled with advanced power management technologies. Advanced cooling systems can also significantly reduce energy consumption.

2. Optimized Software: While based on open source standards, Secure64 applies decades of real-world DNS experience into features and performance unique to its software offerings.

3. Dynamic Resource Management: HPE ProLiant DL325 (and DL345) Gen11 servers powered by AMD-EPYC processors and Secure64 DNS products implement load balancing and resource allocation algorithms that dynamically adjust based on real-time demand can ensure that DNS servers operate efficiently.

CONCLUSION

DNS traffic rises every year as new devices are connected and old ones are not removed. The rise in IoT devices is also fueling new requirements as well as the speed improvements in 4G, 5G and satellite connections.

The combination of Secure64 Caching DNS and AMD EPYC™ processor powered HPE ProLiant DL325 (and DL345) Gen11 servers delivers powerful, robust, and cost-effective solution for modern DNS needs.

Power, space and cooling are major factors in the cost of running DNS servers in a data center. By implementing Secure64 Caching DNS software, HPE servers with EPYC processors, a carrier/ISP can add capacity without adding additional rack space or increasing the power load. At the same time when the task load is low, the power costs are reduced due to the power management of these devices.

DNS servers need to be distributed and pushed as close as is possible to the edge to reduce the latency and improve the user experience. The compact 1RU HPE ProLiant DL325 Gen11 server tested allows for deployment in dense Points of Presence (POPs) close to the user base, reducing latency and improving user experience without compromising performance.

The DNS deployment must be engineered with lots of headroom to support normal load, DDoS attacks and failover scenarios. As the DNS load increases servers utilizing Gen 5 EPYC processors offer the uplift to support modern networks.

This joint solution leverages the strengths of these technologies to provide enhanced performance, strong security features, scalability, and reliability, as well as energy efficiency, making it an ideal choice for enterprises and service providers alike.

For more information about Secure64 **visit www.secure64.com**
www.amd.com