White Paper

Enterprise IT infrastructure
Cost-efficient scale-up infrastructure for SAP HANA

Rethinking how SAP HANA® Scales

Designing Scale-Up Infrastructure for Performance, Certification, and Cost Efficiency in SAP HANA Environments

Authors

Alexandra Roy
Head of Competency Center, Bull

Jan Krueger
Technical Account Director for Team SAP, Intel

Table of Contents

Executive Summary

Enterprises running large, mission-critical SAP HANA® environments are facing a structural shift in infrastructure economics. Memory pricing volatility, particularly for high-capacity DIMMs, is materially impacting total cost of ownership (TCO) for in-memory workloads.

In this environment, research from SAPinsider and the Americas' SAP Users' Group (ASUG) indicates that many organizations are cautious about adopting the latest processor generation for SAP landscapes, seeking clear proof of performance gains, certification assurance, and measurable economic value.

Intel® Xeon® 6 processors, combined with BullSequana SH scale-up systems for SAP HANA, directly address these challenges. SAP-certified glueless 8-socket architectures and the Node Controller for scale-up enable customers to increase performance compared to 4th Gen Intel® Xeon® platforms while maintaining reliability. These architectures also enable more flexible memory population using smaller DIMMs, improving cost control and long-term TCO predictability.

Because SAP HANA operates entirely as an in-memory database, infrastructure economics are strongly influenced by memory capacity requirements–making memory strategy a central factor in TCO. According to Jan Krueger, Technical Account Director for Team SAP at Intel, multi-socket scale-up architectures allow organizations to step down to smaller DIMM sizes while maintaining the required memory footprint. This approach enables customers to deploy SAP HANA environments with the capacity and performance they need while improving overall TCO.

These gains are reflected in SAP HANA benchmark results, where **BullSequana SH81 systems powered by Intel® Xeon® 6 have achieved world-record performance for an 8-socket system**, nearly doubling that of the previous-generation SH80[i].

This white paper demonstrates how BullSequana SH systems based on Intel® Xeon 6 provide a validated and economically efficient platform for SAP HANA modernization—supported by benchmark data, certification, and a long-term joint roadmap between Intel, Bull, and SAP.

1. The Challenge: Rising Memory Costs and Why Scale-up is a Solution

SAP HANA is an in-memory database platform in which operational data is stored and processed directly in system memory.

Memory has become the dominant cost driver in large SAP HANA deployments. Rising prices for high-capacity DIMMs are affecting infrastructure planning and slowing hardware refresh cycles as organizations reassess the balance between performance requirements and capital expenditure.

The impact is particularly pronounced in SAP HANA environments, where system sizing is determined primarily by memory footprint. Traditional sizing strategies that rely on

"In today's memory scarcity and memory price market, larger scale-up systems such as BullSequana provide the means to allow the usage of smaller, cheaper DIMMs to provide the same memory capacity."

Alexandra Roy

populating servers with the largest available DIMMs can substantially increase capital expenditure without delivering proportionate operational benefit.

By increasing socket count and expanding the number of available memory channels within a single system image, enterprises can achieve required memory capacity using smaller, more cost-efficient DIMMs. This approach reduces reliance on premium high-capacity modules and allows organizations to scale memory capacity more economically while maintaining SAP-certified configurations and predictable performance.

When combined with SAP-certified glueless 8-socket architectures and Node Controller technology, scale-up becomes both a performance and economic strategy.

By increasing socket count and expanding the number of available memory channels within a single system image, enterprises can achieve required memory capacity using smaller, more cost-efficient DIMMs. This approach reduces reliance on premium high-capacity modules and allows organizations to scale memory capacity more economically while maintaining SAP-certified configurations and predictable performance.

When combined with SAP-certified glueless 8-socket architectures and Node Controller technology, scale-up becomes both a performance and economic strategy.

2. Architectural Advantages of Scale-up for SAP HANA

2.1. Scale-up Architecture for SAP HANA Systems

While scale-out architectures are commonly used for distributed analytics workloads, large transactional SAP HANA[ii] systems typically benefit from scale-up designs. By maintaining a single system image and limiting inter-node communication, scale-up architectures simplify workload behavior and support more predictable performance for mission-critical environments.

Alexandra Roy notes that scale-up architectures provide a simpler view of the system where everything is in the same box and additional complexity is kept to a minimum. While scale-out can address very large systems, it introduces networking and NUMA considerations, and performance is generally lower than a similarly sized scale-up system.

"Scale-up provides a more simple view of a computer architecture where everything is in the same "box" and additional complexity is kept to a minimum."

Alexandra Roy

SAP HANA is an in-memory database platform that enables the storage and processing of operational data directly in system memory. As a result, system architecture—particularly memory capacity, bandwidth, and processor throughput—has a direct impact on the size and performance characteristics of supported workloads. For large SAP HANA deployments, infrastructure platforms must therefore provide sufficient memory capacity and sustained memory bandwidth while operating within configurations certified and supported for SAP HANA production environments.

Glueless scale-up designs allow up to eight processor sockets within a single coherent system image using the native interconnect capabilities of the Intel Xeon processor platform, without requiring external chipset logic. Systems based on this architecture can be deployed in configurations that are certified by SAP for SAP HANA, ensuring that performance, reliability, and scalability requirements for production environments are met.

Maintaining a single-system architecture reduces inter-node communication overhead and helps preserve the low-latency characteristics required by large in-memory database workloads. Within this framework, Node Controller technology enables further expansion of memory and compute resources across multiple sockets while maintaining SAP-certified configurations for large-scale SAP HANA deployments.

2.2. BullSequana SH Scale-up Platform

BullSequana SH systems are designed to support the large memory footprints required by multi-terabyte SAP HANA deployments. The platform supports SAP-certified scale-up configurations, including glueless 8-socket architectures, and integrates Node Controller technology to extend memory capacity across multiple processor sockets.

As Alexandra Roy and Jan Krueger explain, the SAP appliance certification process involves coordinated engineering across Bull, SAP, and Intel to ensure that hardware and software components are tuned to meet SAP HANA performance and stability requirements.

BullSequana SH systems combine Intel Xeon 6 processors with SAP-certified configurations and a scale-up architecture designed to support large memory footprints and sustained in-memory database workloads.

Coordination between Intel, Bull, and SAP supports the development and validation of infrastructure platforms for SAP HANA deployments. This collaboration includes processor roadmap alignment, system-level testing on BullSequana SH platforms, and verification of SAP HANA-certified configurations. These activities help ensure that new processor generations and scale-up system designs can be deployed within SAP-certified environments as they become available, supporting long-term infrastructure planning for SAP HANA deployments.

Figure 2. PP BullSequana rack01

Alexandra Roy highlights how BullSequana systems are designed to address key infrastructure considerations for enterprise environments, including scalability, performance, sovereignty, and energy efficiency.

2.3. Performance and Scalability Validation

Benchmark testing[iii] comparing SAP HANA workloads on BullSequana SH systems based on Intel Xeon 6 processors with equivalent systems based on 4th Gen Intel Xeon processors demonstrates higher workload throughput and improved consolidation capability within SAP HANA-certified configurations.

This is evidenced by SAP HANA benchmark[iv] results, where BullSequana SH81 systems powered by Intel Xeon 6 have achieved world-record performance for an 8-socket system, nearly doubling results from the previous-generation SH80 platform. These results are derived from SAP HANA benchmark measurements[v] conducted on certified and supported SAP HANA hardware and provide a documented basis for evaluating platform performance across processor generations.

Within scale-up architectures, this level of performance enables organizations to support larger in-memory database workloads and consolidate more SAP application instances within a single system image. Because these benchmarks are conducted within SAP's official certification framework, they also confirm that tested configurations meet the stability and scalability requirements expected for enterprise SAP deployments.

For organizations migrating from BullSequana SH systems based on 4th Gen Intel Xeon processors, these performance improvements translate into the ability to support larger SAP HANA workloads within a single system and increase consolidation of application instances on the same platform generation.

2.4. Optimizing Memory Configuration and Total Cost of Ownership

Within scale-up architectures, increasing socket count and available memory channels provides greater flexibility in how memory is configured. This enables organizations to use smaller, more cost-effective DIMMs to reach target capacities, reducing reliance on premium high-capacity modules and improving cost-per-terabyte efficiency.

In a volatile memory market, this flexibility allows organizations to manage infrastructure costs more predictably while maintaining performance and SAP-certified configurations. Rather than overprovisioning memory using high-capacity DIMMs, organizations can align memory investment more closely to workload requirements over time.

Node Controller-enabled scale-up configurations further

Figure 1. Gen-on-Gen Xeon Performance Gains

"Larger DIMMs are currently the most expensive and most constrained modules. Stepping down to smaller DIMMs requires more CPUs, but overall TCO is more favorable with multi-socket systems."

Jan Krueger

support this approach by allowing memory to scale efficiently across the platform while preserving a single system image. This combination of architectural flexibility and certified performance provides a more balanced model for managing both scalability and long-term infrastructure cost.

3. Modernization Opportunity: From 4th Gen Intel Xeon to Intel Xeon 6

3.1. Growing SAP HANA Scale and Customer Concerns

SAP HANA environments continue to grow in both scale and operational complexity. As organizations transition to SAP S/4HANA and consolidate previously distributed workloads, these platforms increasingly support advanced analytics and AI-driven processes within core business operations. This evolution places increasing demands on infrastructure, requiring higher compute throughput and sustained memory bandwidth while maintaining stable system operation.

Infrastructure leaders evaluating next-generation platforms must therefore assess whether the transition from 4th Gen Intel Xeon processors delivers sufficient performance improvement to justify hardware refresh cycles. At the same time, they must ensure that SAP certification remains robust at larger scale and that modernization efforts support long-term improvements in total cost of ownership.

3.2. Refreshing from Intel Xeon 4th Gen to Intel Xeon 6

For customers currently running SAP HANA on 4th Gen Intel Xeon platforms, Xeon 6[vi] represents a significant architectural advancement. Improvements in compute density, platform scalability, and memory subsystem capabilities enable higher consolidation ratios and improved workload efficiency.

Rather than representing a routine generational upgrade, modernization provides an opportunity to realign infrastructure design with current memory pricing realities and long-term growth expectations. As Alexandra Roy notes, this is particularly relevant in scale-up environments built on modular system architectures[vii]. Organizations can begin with a 4- or 8-socket BullSequana configuration sized to current CPU and memory budgets, and then expand capacity over time as requirements evolve.

3.3. Performance Overview with SAP Benchmarks

SAP HANA benchmarks provide objective validation of platform capabilities for large-scale in-memory workloads. These benchmarks measure performance under standardized conditions defined by SAP, allowing infrastructure leaders to compare certified system configurations across processor generations and hardware platforms.

These results published for Intel Xeon 6-based systems demonstrate measurable performance improvements compared to prior generations and offer a valuable reference for comparing platform performance under standardized conditions. To ensure a smooth and fully supported deployment, customers should validate certification and supportability for the specific system configurations they plan to implement.

For organizations evaluating infrastructure modernization, benchmark data provides a transparent reference point for assessing how new platforms perform at scale and whether they meet the performance and capacity requirements of production SAP HANA environments.

Because these benchmarks are conducted within SAP's official certification framework, they also confirm that tested configurations meet the stability and scalability requirements expected for enterprise SAP deployments.

"Organizations can begin with a 4- or 8-socket BullSequana configuration sized to current CPU and memory budgets, and then expand capacity over time as requirements evolve."

Alexandra Roy

SAP and Intel also share a common vision of enabling AI-first enterprises through flexible, scalable, and trusted cloud environments.

By combining SAP's cloud platforms with Intel Xeon processor innovations, organizations can run SAP workloads and AI applications seamlessly across public cloud, private cloud, and sovereign cloud infrastructures, while maintaining consistency in performance and operational models. This integrated approach supports a true hybrid and multi-cloud strategy, allowing enterprises to deploy and scale applications where it makes the most sense, whether in hyperscaler environments, SAP-managed cloud services, or locally controlled sovereign cloud infrastructures.

A key advantage of this model is the ability to bring AI closer to where data resides. Enterprises can process and analyze data within SAP environments without unnecessary data movement, enabling faster insights, reduced latency, and better cost control. At the same time, this approach ensures that sensitive data can remain within compliant and secure cloud environments, addressing increasing regulatory and sovereignty requirements across industries and geographies. Organizations can therefore innovate with AI while maintaining control over data governance, privacy, and compliance frameworks.

Through deep joint engineering, co-validation, and SAP certification processes, SAP and Intel optimize cloud-ready infrastructure for SAP HANA and next-generation SAP workloads. As a result, organizations can build and operate AI-driven services across hybrid cloud landscapes with greater flexibility and efficiency. They gain the ability to scale dynamically, integrate services across environments, and future-proof their SAP investments while accelerating digital transformation. This cloud-centric foundation ultimately provides a unified, secure, and high-performance platform for running mission-critical SAP applications and AI workloads at enterprise scale.

More information about edge-to-cloud solutions: https://www.intel.com/content/www/us/en/partner/showcase/sas/overview.html

4. Summary

Large SAP HANA deployments place sustained demands on system memory capacity, bandwidth, and processor throughput[xi]. As these environments expand in scale, infrastructure architecture plays a central role in determining performance characteristics, deployment flexibility, and long-term operating costs.

The analysis presented in this paper shows that scale-up architectures based on Intel Xeon 6 processors and BullSequana SH systems support larger SAP HANA workloads within SAP-certified[xii, xiii] configurations while improving processor and memory subsystem performance compared with systems based on 4th Gen Intel Xeon processors. Platform features such as glueless multi-socket architectures and Node Controller technology allow organizations to scale memory capacity across multiple sockets while maintaining SAP HANA-certified deployment models.

For infrastructure leaders planning SAP HANA modernization, these characteristics provide a basis for evaluating platform transitions from 4th Gen Intel Xeon-based systems to newer processor generations while maintaining compatibility with SAP certification requirements and long-term infrastructure planning.

5. Considerations for Infrastructure Evaluation

Key evaluation criteria for modernizing large SAP HANA environments include assessing current infrastructure against workload growth and memory cost trends, reviewing SAP benchmark results for certified configurations, validating architecture against SAP HANA certification requirements, and evaluating scale-up options based on Intel Xeon 6 processors and BullSequana SH platforms.

Figure 3. Hear what SAP customers are expecting from next-generation server platforms in this video by Jan Krueger

6. References

i. Bull's BullSequana SH81, powered by Intel Xeon 6 processors, achieved a world-record SAP HANA benchmark result, with performance nearly doubling that of the previous-generation SH80: https://www.bull.com/en/blog/breaking-records-maximum-performance-sap-hana. See https://www.sap.com/dmc/benchmark/2026/Cert26001.pdf. Results may vary.

ii. SAP. "What is SAP HANA?" (product overview): https://www.sap.com/products/data-cloud/hana/what-is-sap-hana.html

iii. SAP. "SAP Standard Application Benchmarks" (overview): https://www.sap.com/about/benchmark.html

iv. SAP. "SAP Standard Application Benchmarks-NetWeaver Benchmarks" (includes SAP BW edition for SAP HANA benchmark): https://www.sap.com/about/benchmark/appbm/netweaver.html

v. SAP. "SAP Standard Application Benchmarks" (procedure and policy): https://www.sap.com/about/benchmark/appbm.html

vi. SAP. "Identifying supported SAP HANA hardware" (overview of SAP HANA hardware directory and certification concept): https://learning.sap.com/courses/sap-hana-installation-and-administration/identifying-supported-sap-hana-hardware

vii. Intel. "Intel Xeon processors-Intel Xeon 6 processors" (product family page): https://www.intel.com/content/www/us/en/products/details/processors/xeon.html

viii. SAP RISE only.

ix. See https://www.sap.com/dmc/benchmark/2025/Cert25016.pdf. Results may vary.

x. See https://www.sap.com/dmc/benchmark/2023/Cert23075.pdf. Results may vary.

xi. Intel. "Intel Xeon 6 product brief" (architecture, series, platform and feature overview): https://www.intel.com/content/www/us/en/products/docs/xeon-6-product-brief.html

xii. Bull. "BullSequana SH" (product overview; SAP HANA positioning and scale-up suitability): https://www.bull.com/en/products/enterprise-computing/scale-up-bullsequana-sh

xiii. Bull. "BullSequana SH81 successfully passed SAP HANA hardware certification procedures" (certification announcement; configuration highlights): https://www.bull.com/en/certifications/bullsequana-sh81-passed-sap-hana-hardware-certification

7. Contributors

Alexandra Roy is Head of Competency Center at Bull. She drives engineering excellence and aligns capabilities with Bull's strategic objectives: Close collaboration with R&D, manufacturing, and key partners such as SAP and Intel is critical to securing SAP HANA certifications and accelerating time-to-market while maintaining strict quality and risk control. With a strong focus on performance, scalability, and robustness, she ensures that the solutions delivered to Bull's clients meet the highest standards of excellence.

Jan Krueger is Technical Account Director, Team SAP at Intel. He is responsible for driving and aligning technology enablement and adoption at SAP and across the SAP ecosystem. His work supports an integrated ecosystem that enables SAP customers to deploy and operate SAP landscapes with high resiliency and optimized TCO.

intel XEON