



# LENOVO'S FULL-PORTFOLIO HPC

From HPC ownership to Hardware-as-a-Service to off-premise public cloud — and all stages in between — Lenovo offers the complete array of HPC solutions

Lenovo has developed a three-pronged consumption model based on traditional HPC ownership, HPC Hardware-as-a-Service (HaaS) and Off-Premise public HPC Cloud. Every organization's HPC workloads and applications, of course, will demand a different blend of these three paradigms. Some may opt for the more traditional route of full ownership of HPC assets, while others may opt for the flexibility and scalability of HPC HaaS and HPC Cloud. Many will choose a blend found somewhere in the middle, between any combination of these individual consumption models.

In all cases, Lenovo solutions specialists in tandem with channel partners and leading HPC Cloud providers will provide the resources customers need to discover their optimal research computing consumption model.

This world-class Lenovo team will enable you to optimize your HPC configuration for your own unique blend of workloads and use cases.

## Introduction

Nowadays, an increasing number of HPC users are adopting a hybrid HPC approach for their computing needs. As one 2018 technical literature survey put it, "A mix of on-premise cluster and cloud seems to be a proper environment to balance [one's HPC needs]." <sup>1</sup> (Included in these researchers' definition of "cloud" was "as-a-Service" offerings as well.)

Enterprises should evaluate the potential of a healthy mix of on-premise, Cloud, and as-a-Service HPC environments in order to optimize their HPC investment. The concept is intuitive too. Different compute environments and consumption models address different use cases and workload needs. Why wouldn't anyone want to achieve, given their own organization's unique technical and financial requirements, the best of all worlds?

As one of the world's fastest-growing HPC providers and most trusted server, storage and technology brands, Lenovo recognizes the market's drive toward HPC diversification.

As a result, Lenovo presents a comprehensive triad of HPC consumption models from which consumers can achieve their own ideal blend. Those three Lenovo consumption models are:

- **Traditional HPC ownership.** The award-winning hardware lines and service models that Lenovo and its partners offer connect two world-class offerings to provide expanded choice in consuming compute.
- **HPC Hardware-as-a-Service.** With this **NEW offering**, Lenovo manages HPC assets on behalf of the customer and offers the system as a consumable product — allowing for continual growth and expansion as workloads grow, at agreed upon pricing.
- **HPC Cloud.** Lenovo, in partnership with a leading, purpose-built high performance Cloud provider, has unveiled cloud service models for HPC users to seamlessly burst into peak compute and storage without straining their resources or budget.

## HPC Ownership

No matter how technologically sophisticated an HPC cloud or "as a Service" environment may be, there is always a case to be considered for full ownership of HPC assets. Owning and operating one's hardware and software offers immediate and tangible benefits. Especially for baseload, mission-critical operations, HPC ownership is often an attractive option. Yet, other factors can impact an organization's decision to acquire HPC resources — including power and cooling prices, IT staffing, data center space, security, system maintenance and application licenses. In some cases, alternative consumption models beyond outright ownership of HPC systems could also be beneficial.

However, for those who choose ownership of their HPC solutions, Lenovo is uniquely situated at the crossroads between industry and pure research to provide on-premises HPC/AI servers, storage, power and infrastructure no matter the workload or deployment.

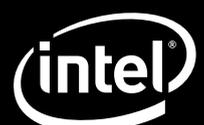
Seventeen of the top 25 research universities and institutions across the globe now deploy Lenovo's comprehensive HPC and AI solutions. Lenovo also garnered industry acclaim, winning the HPCwire 2018 Readers' and Editors' Choice Awards for Best Use of HPC in Physical Sciences, Best AI Product or Technology, Top Energy-Efficient HPC Achievement and Best Use of HPC in Manufacturing.<sup>2</sup> Yet for all its refined, award-winning prowess, Lenovo also enjoys broad deployment across global industry, academic and government lab environments. As of Nov. 2018, Lenovo remains the number one HPC manufacturer as measured by entrants in the Top 500 list of the world's fastest supercomputers.<sup>3</sup>

As deployed by Lenovo and its partners, Lenovo on-premise compute offers an attractive portfolio of solutions for when HPC and AI assets are pivotal to the business. HPC ownership and operation of course provides the benefit of a purpose-built cluster for best-performance for your specific workloads. In that sense, nothing can rival on-premises HPC for continual workloads and job submissions.

Lenovo's acclaimed system installation and managed services offerings ensure users can extract maximum value from their on-premises HPC compute and storage systems. Yet, even a fully deployed and realized on-premises HPC solution still can benefit from additional capability off-premises.

<sup>2</sup> "HPCwire Reveals Winners of the 2018 Readers' and Editors' Choice Awards at SC18 Conference in Dallas, TX," HPCwire.com (Nov. 12, 2018)

<sup>3</sup> "The top ten systems manufacturers (by number of systems) are Lenovo (140), Inspur (84), Sugon (57), Cray (49), HPE (46), Bull (22), Fujitsu (15), Huawei (14), Dell EMC (13), and IBM (12)." Quoted from "China Extends Supercomputer Share on TOP500 List, US Dominates in Total Performance" top500.org (Nov. 11, 2018)



## HPC Hardware-As-A-Service (HaaS)

Lenovo offers an attractive new model to help facilitate changing buying preferences and accounting principles. Rather than treating your entire HPC deployment as an up-front CapEx expenditure, HPC Hardware-as-a-Service (HaaS) enables users to budget HPC usage on an OpEx consumption basis.

With HPC HaaS, Lenovo manages the asset on behalf of the customer and offers the system as a consumable product. HPC HaaS — as a new financial model of HPC computing — is versatile, flexible and simple to deploy and consume:

- **Versatile.** Choose the solution(s) best suited for your requirements from Lenovo's complete product portfolio. Easily adjust or add new hardware as your business needs expand.
- **Flexible.** Pay only for what you're using, not what you own. Your custom plan gives you what you need, whenever you need it, with no minimum commitment from 0% to 100%.
- **Simple.** Lenovo deploys, monitors and installs to help ensure maximum uptime, ROI, and achievement of your business goals. A dedicated Customer Success Manager serves as your long-term partner and handles your issues exclusively.

HPC HaaS users can also be assured their workloads will be run across the same top-tier hardware and software environments they have come to trust in Lenovo's broad-based portfolio of HPC solutions and deployment models.

## HPC Cloud

As a third component of the HPC consumption model, many organizations are looking to the cloud to provide ample bursting to augment on-premises computing resources. Spiking workloads and changing/expanding projects demand the kind of ultimate flexibility Lenovo cloud-based HPC provides.

To be clear, Cloud is a combination of many capabilities that enable the delivery of IT infrastructure resources, applications, and services to IT consumers either on-demand or by subscription (e.g. reservation). These Cloud capabilities require an agile operating model that can be dynamically scaled and tuned in response to (or even in anticipation of) changing consumer requirements.

Lenovo has teamed up with HPC cloud provider Nimble to provide a Lenovo bare metal, containerized HPC platform with billing down to the second — all built on the Lenovo HPC products you know and trust today. The Lenovo-Nimble partnership allows for jobs to easily be submitted to an on-premise resource or to the Nimble cloud via their powerful system manager - JARVICE- all via one job scheduler.

All three HPC consumption models — ownership, HPC Hardware as a Service, HPC Cloud — are built on a foundation of HPC systems, powered by the Intel® Xeon® Scalable processor, deliver game-changing benefits, from advancing R&D to handling bigger data sets and workloads. Lenovo has also been an early and enthusiastic supporter of Intel's Scalable Systems Framework (SSF), of which Intel® Omni-Path® Architecture (OPA) is a critical component. OPA provides the high-performance interconnectivity required to optimally scale many of Lenovo's leading HPC and AI solutions.

Furthermore, Lenovo is committed to helping customers leverage the many benefits of SUSE Linux Enterprise Server to create powerful, scalable business solutions. As a pioneer in open source software, SUSE provides reliable, interoperable Linux and cloud infrastructure solutions that help enterprises increase agility, manage complexity, and reduce cost. Engineering excellence and exceptional service allow them to adapt and deliver the smarter innovation customers need to succeed—today and tomorrow.





## Conclusion

Achieving the optimum and most cost-effective blend of Lenovo scalable HPC compute power has never been simpler or more flexible. Lenovo's three-pronged approach to traditional HPC ownership, HPC HaaS and HPC cloud computing frees users to solve their greatest challenges.

With Lenovo HPC, there's no barrier to interacting with sophisticated, award-winning, industry-leading computing capabilities. Lenovo's full portfolio of HPC and AI solutions are fine-tuned to your industry's emerging requirements, giving you the competitive edge. Contact your Lenovo solutions specialist or Lenovo's leading partners to discover how to achieve your optimum HPC configuration today.



**CONTACT YOUR LENOVO REPRESENTATIVE**

