White Paper

Cloud Services
Intel® QAT Engine, Intel® QuickAssist Technology

Unlocking Efficiency and Agility at Scale

NTT collaborated with Intel to deliver an automated Kubernetes solution to transform the IT ops experience for its customers in the Financial and Public Sectors.

"Intel's QuickAssist Technology (QAT) has been a game-changer for us, elevating both the performance and efficiency of our automated Kubernetes platform. By offloading intensive cryptographic operations, QAT has enabled us to achieve scalability and security ensuring robust and future-proof solutions"

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Executive Summary

In the dynamic realm of contemporary IT operations, the adoption of containerization and orchestration technologies has evolved into a pivotal strategy for organizations seeking to transcend traditional constraints and embrace unparalleled agility, scalability, and operational efficiency.

At the forefront of this technological evolution stands Kubernetes, an open-source container orchestration platform that has emerged as the industry's de-facto standard. Its transformative influence reshapes the very foundations of how organizations deploy, scale, and manage containerized applications. The fundamental concept of containerization involves encapsulating an application along with its dependencies within a lightweight, portable container. In stark contrast to traditional virtualization approaches, containers share the host OS kernel. This results in significantly faster startup times and enables more efficient utilization of resources.

In partnership with Intel, NTT introduces the Automated Kubernetes Platform, a revolutionary solution for sectors prioritizing data security, scalability, and reliability. Leveraging Intel's cutting-edge technologies, this platform provides a seamless, automated, and scalable environment for deploying and managing containerized applications.

The solution's versatility is underscored by its integration with key applications, offering users a comprehensive toolset for modern application management. With a tiered subscription model, it caters to diverse user needs, ensuring flexibility and immediate access to features upon subscription.

NTT's Automated Kubernetes Platform significantly impacts efficiency, resource utilization, scalability, reliability, uptime, and redundancy. Beyond addressing present challenges, it sets the stage for a future-ready IT landscape, making it relevant not only for the Financial and Public Sectors but also for industries seeking resilient, adaptable, and cutting-edge IT solutions. This collaborative effort with Intel showcases the transformative power of strategic partnerships in shaping the digital future.

The Rise of Containerization in IT

At its essence, containerization presents a paradigm shift by packaging applications in a self-sufficient unit, ensuring consistent performance across diverse computing environments. Kubernetes, often affectionately abbreviated as K8s, amplifies the capabilities of containerization by providing a robust and extensible framework.

Solving the Containerization Puzzle

NTT developed a cutting-edge automated Kubernetes solution with robust features, unparalleled flexibility, and seamless compatibility with diverse applications. This solution was further optimized using Intel's advanced technology and cloud expertise. The result was a reliable, scalable, and automated platform dedicated to deploying and managing containerized applications.

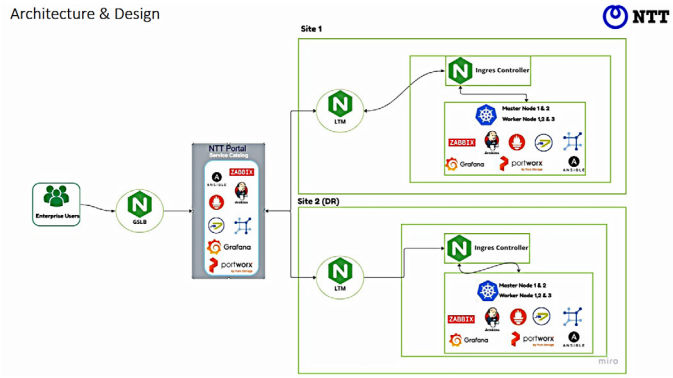

Figure 1: The architecture of NTT and Intel's Kubernetes solution

The solution integrates seamlessly with a spectrum of essential applications, including AWX, Jenkins, Prometheus, Netbox, Portworx, Zabbix, JS7, Grafana, and NGINX Ingress Controller. This amalgamation doesn't merely offer compatibility; it forges a comprehensive toolset, empowering users with a rich arsenal for modern application management. A tiered subscription model adds another layer of customization, allowing customers to tailor the solution to their specific needs — from a basic setup to a fully-featured, Intel-backed enterprise setup.

The implementation of this solution represents the nexus of NTT's innovative approach and Intel's technological prowess:

1. **Intel® QuickAssist Technology (QAT) Installation and Configuration:** This hardware accelerator becomes the linchpin, enhancing the solution's performance by offloading compute-intensive processing tasks like cryptography and compression from the CPU to the accelerator, freeing up CPU utilization1 for application workloads.
2. **OpenSSL and Intel® QAT Engine for OpenSSL Installation:** OpenSSL, a robust toolkit for TLS and SSL protocols, enabled and integrated with Intel® QAT Engine for OpenSSL, delivers elevated performance. Offloading cryptography workloads to the Intel® QuickAssist Technology hardware accelerators ensures optimal efficiency1.
3. **Nginx Installation and Optimization Settings:** Serving as the ingress controller for Kubernetes, Nginx takes center stage, managing external access to services within the cluster. Its optimization ensures high concurrency1, superior performance1, and minimal memory usage1.
4. **Performance Testing Tools:** This automated Kubernetes solution doesn't stop at deployment; it thrives on continuous improvement. Performance testing tools delve into the intricacies, offering insights, identifying bottlenecks, and enabling ongoing optimization for the efficient, reliable, and scalable management of containerized applications.

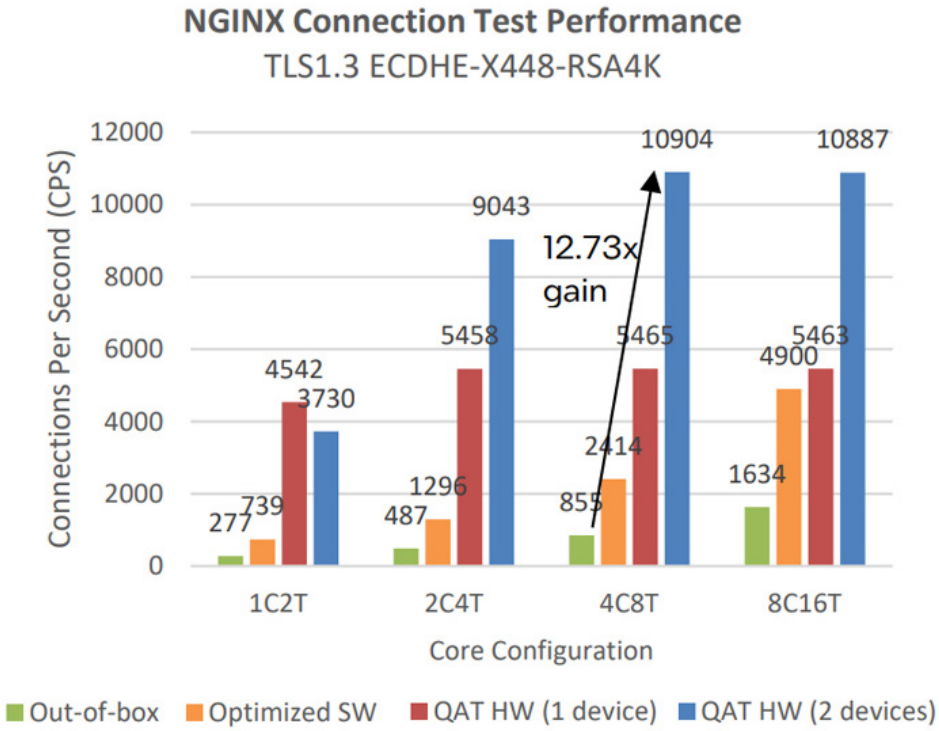

Figure 1: Benchmarking data for NGINX showing the performance improvement

The end-users, in both on-premises and cloud-based deployments, stand to gain immeasurable benefits from this joint NTT-Intel solution. Seamlessly managing and scaling containerized applications becomes an achievable reality. The platform's extensive automation reduces manual management overhead, ensuring applications consistently remain in their desired state. It's not just a solution; it's a pathway to comprehensive control, flexibility, and a future where IT operations align seamlessly with business goals.

Impact and Results of NTT's Automated Kubernetes Solution

NTT developed a cutting-edge automated Kubernetes solution with robust features, unparalleled flexibility, and seamless compatibility with diverse applications. This solution was further optimized using Intel's advanced technology and cloud expertise. The result was a reliable, scalable, and automated platform dedicated to deploying and managing containerized applications.

1. Improved Efficiency: Leveraging Intel's high-performance hardware and software tools, NTT's solution introduces automation to the deployment of applications on Kubernetes. This strategic integration significantly enhances the efficiency of IT operations, streamlining the deployment process and reducing manual intervention.
2. Optimized Resource Utilization: The solution, fortified with Intel's cutting-edge technologies, excels in the optimal utilization of organizational resources. By leveraging Intel's advancements, NTT ensures that resources are allocated efficiently, minimizing waste and, in turn, enhancing the overall performance of the IT infrastructure.
3. Enhanced Scalability: Backed by Intel's robust technologies, NTT's automated Kubernetes solution empowers applications to scale effortlessly in response to varying demands. This scalability not only results in an improved user experience but also contributes to higher satisfaction levels among end-users, meeting the dynamic needs of modern organizations.
4. Reliability: The integration of Intel's tools into the solution reinforces superior reliability. Through automated application management and deployment, the solution minimizes the likelihood of human error, providing a dependable framework that reduces application downtime and ensures continuous operation.
5. Uptime Maximization: A primary objective of this automated Kubernetes solution is to maximize uptime. The system's architecture and Intel's support mechanisms work synergistically to ensure applications remain available and operational. This proactive approach significantly decreases the impact of disruptive and costly downtime.
6. Redundancy Assurance: Redundancy, a vital feature of the solution, is further strengthened with Intel's support. By deploying multiple master and worker nodes, the solution guarantees high service availability, even in the face of a single component failure. This fortification minimizes the risk of system-wide failure, enhancing the overall reliability of the IT infrastructure.

The collaborative effort between NTT and Intel has not only addressed the challenges faced by organizations in the Financial and Public Sectors but has also ushered in a new era of operational excellence, where efficiency, scalability, and reliability are at the forefront of IT management.

Paving the Way for a Future-Ready IT Landscape

The success of this joint solution is underscored by its tangible impact on efficiency, resource utilization, scalability, reliability, uptime, and redundancy. Intel's high-performance hardware and software tools, coupled with NTT's strategic approach, have ushered in a new era of IT excellence. The solution's ability to automate deployment processes, optimize resource usage, and ensure superior scalability has reshaped the way organizations approach IT management.

Looking forward, the potential of NTT's Automated Kubernetes solution extends beyond the Financial and Public Sectors. As industries across the spectrum seek robust, reliable, and scalable IT solutions, the comprehensive features and flexibility embedded in this solution position it as a viable choice for diverse sectors. The adaptability showcased in addressing the unique challenges of the Financial Sector's sensitive financial data and the Public Sector's critical service delivery underscores its relevance in a multitude of domains.

As technology continues to evolve, NTT's Automated Kubernetes solution serves as a testament to the transformative power of strategic partnerships and cutting-edge solutions. The vision is clear: a future-ready IT landscape where organizations, regardless of the sector, can seamlessly navigate the demands of a dynamic digital era with agility, precision, and operational excellence.

Table 1: Platform Hardware Configuration

Hardware	Description
Processors	4th Gen Intel® Xeon® Scalable Processor Two Sockets Intel 6438 Processors
DRAM	16x 64GB Dual Rank DDR5 4800MHz 1 DIMM per channel Total Memory 2048GB
Network Interface Card	2x Dual Port 100GbE Intel® Ethernet Network Adapter E810-2CQDA2 (Gen 4x16)
Storage	2x 960GB SSD NVMe solution as boot device

Footnotes:

1: The test procedure measured the average amount of TLS requests by clients to the NGINX server completed per second, and different test configurations included using IPSec Multi Buffer and IPP Crypto libraries, or Intel Quick Assist Technology (QAT) to improve the performance. The number of cores used for NGINX was varied throughout the testing. In the 4C8T test configuration, the maximum connections per second (CPS) in the out-of-box SW case was 855, while the QAT HW (2 devices) case had 10904 CPS. This is approximately a 12.7x improvement which emphasizes the value of QAT for NGINX applications.

Reference: Intel RDC# 787009 VRC for NFVi and SASE

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