

Solution Brief

Scalable Edge Cloud Computing
Artificial Intelligence



Providing the Power of the Cloud Anywhere at the Distributed Edge with NodeWeaver

The NodeWeaver Edge Cloud, powered by Intel® technologies, enables streamlined and scalable computing at the distributed edge with its autonomic, self-healing nano-cloud operating platform that installs on the bare metal of nearly any hardware.

NODEWEAVER

AI at the Edge

55%

of enterprises will rely on AI for business-critical workloads by 2024¹

25 billion

IoT devices will be deployed globally by 2030²

IDC estimates data generated from connected IoT devices to be

73.1 ZB

by 2025, growing from 18.3 ZB in 2019³

The Growing Volume of Data Generation is Driving Demand for Faster Computation through Edge Computing

With advancements in AI, computer vision, and machine learning technologies, companies are unlocking the value of data at the edge to improve insights and real-time response and decision making. This development has led to an explosion of the number of devices at the edge, but these connected devices generate a massive amount of data which is simply too large to transfer to the cloud. Sending data to the cloud for processing can mean increased latency, added processing and storage costs, and increased security risk in transferring sensitive information through the entire network. Additionally, in situations that require near real-time data processing and response—such as safety monitoring applications, industrial automation tasks, emergency task executions at energy plants, and more—speed is a critical factor. Sending nonessential data all the way to the cloud for processing isn't efficient or necessary. Therefore, businesses have been adjusting their compute strategies towards incorporating edge computing.

However, businesses implementing edge compute strategies to supplement their hyperscale cloud and datacenters present several business and computational hurdles, including:

- Compute resources could be in separate islands where they cannot communicate to coordinate computation
- Locations of compute resources may be difficult or costly to access
- Compute in ruggedized enclosures might not be expandable
- Technicians to perform the work may not be easily available
- Devices across the network may be incompatible due to heterogeneity

Businesses need to maintain maximum efficiency and uptime for their machines and servers in order to optimize operations and drive greater profit margins. When typical distributed edge architecture operations that span across remote locations experience disruptions, expensive technicians must spend valuable time traveling to locations and diagnosing issues; resulting in downtime and disruptions to processes, slowing down business and increasing cost of ownership. Additionally, device incompatibility due to heterogenous hardware presents several challenges for upgrading and future proofing compute systems for a more developed network infrastructure.

To address these challenges, businesses need a solution that:

- Brings the power of the cloud to the data instead of bringing the data to the cloud for a more robust and efficient compute network in a lightweight footprint
- Integrates edge computing to reduce the latency of vital data processing, as well as increase data security by minimizing remote data transfer
- Self-manages autonomically when issues arise without requiring user intervention to reduce otherwise costly downtime and technician costs
- Deploys with zero user intervention to reduce deployment cost, handling, and increase time to value
- Scales easily in the future with a hardware agnostic solution that easily expands into the existing cluster of edge nodes

NodeWeaver Edge Cloud Provides a Zero-Touch Deployable, Autonomously Managed, and Hardware Agnostic Solution

NodeWeaver Edge Cloud is a software-defined, zero-management Edge cloud fabric— integrating storage, networking, and virtualization into a single system that runs directly on bare metal hardware, and enables highly resilient, agile and scalable

“

A focused approach on small clouds in vertical sectors gives NodeWeaver something of a blue ocean strategy: an area of the market not well served that we know of.

”

– A Technology Industry Analyst Company

compute clusters capable of running multiple virtual machines and container-based workloads, reliably and cost-effectively.

Its “nano-cloud”-like operating structure simplifies the deployment, management, and orchestration of infrastructure and applications at the distributed edge.

NodeWeaver introduces a totally different approach from other cloud or virtualization platforms: instead of a large central cloud controlling a number of dependent nodes, the platform enables fleets of small clouds at mass scale, managed centrally, but operating autonomously. Therefore, there is no need for manual technician intervention for handling system-related issues as they are handled with the autonomic engine inside each individual node within an edge cluster. NodeWeaver empowers users to tell the system which application they want to run and everything else is handled by the platform.

From energy companies requiring sophisticated real-time monitoring, to companies building out large remote networks with limited IT support, NodeWeaver enables customers to deploy the applications they require without complex planning and procedures.



How NodeWeaver Works

Deployment: Deployment is streamlined and simplified—customers provide NodeWeaver’s patent-pending DNSOps deployment mechanism a few pieces of basic information, such as the list of edge locations and a minimum set of parameters. Customers can select their choice of Intel-powered hardware that best suits their needs. Customers then simply download the installer onto their own USB key and plug into the desired device at its designated location. Upon boot, the system automatically finds its configuration from the network and the cluster as well as all applications are automatically deployed.

Operation: NodeWeaver runs directly on the bare metal of nearly any x86 based server (node), and requires only one physical core and 1GB of RAM for the entire stack – leaving the maximum amount of system resources for workloads. Clusters are comprised of one or more nodes, and each cluster runs independently and autonomously to execute tasks but can also be managed centrally as

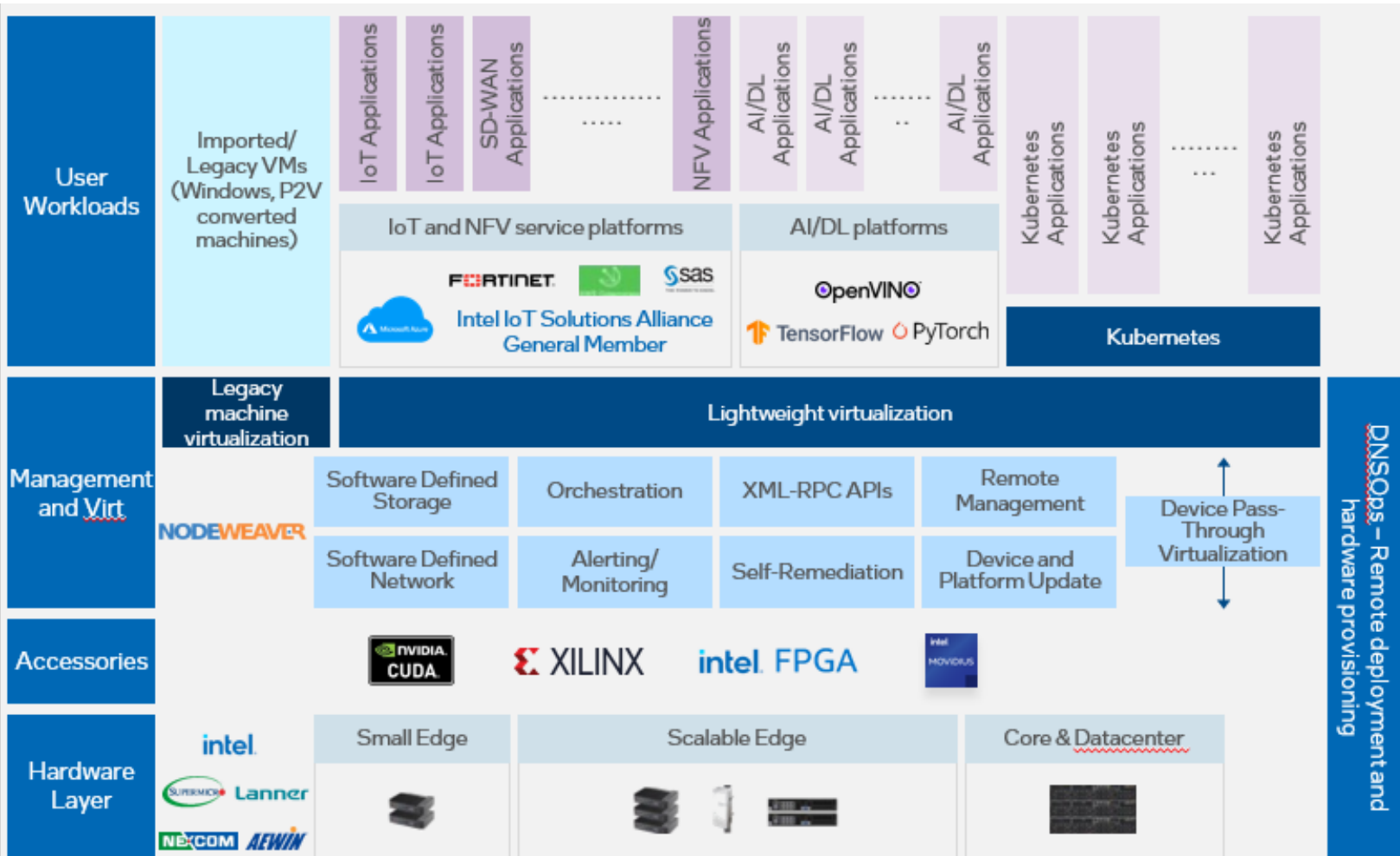
entire fleets of clusters.

This capability is important for customers with edge locations where connectivity to a network can be limited or restricted, or the option to manage individual clusters locally is critical.

The solution has an easy-to-use interface and a management system that automates most tasks, using NodeWeaver’s built-in Autonomic Engine, simplifying operations and reducing the need for IT expertise or human intervention. Besides the main dashboard, the system can also be reached through a public IP address, even behind a firewall, to control the cluster of nodes and check statuses, processes, network and more. Lastly, customers can also manage clusters by an API call for a more streamlined and programmatic management approach, using standard tools such as Ansible or Terraform.

Optimized for running workloads at the edge, the solution offers ease of use and flexibility for all use cases.

Solution Diagram



Key End Customer Benefits



Minimizes Total Lifecycle Cost of Edge

NodeWeaver saves businesses costs by managing issues autonomously, decreasing need for physical user intervention and expensive IT costs, as well as by maximizing resources for actual workloads instead of overhead for running the platform like other solutions.



Improves operational efficiency

NodeWeaver's software includes self-optimization features that recognize which Intel® processor is running the device and adjusts resources to maximize performance. The autonomic engine also handles issues automatically to minimize operational downtime or disruptions.



Enables compute flexibility

NodeWeaver adapts to heterogenous hardware automatically, empowering organizations to expand their infrastructure and handle edge clusters with nodes of varying hardware, to simplify future growth and operations.

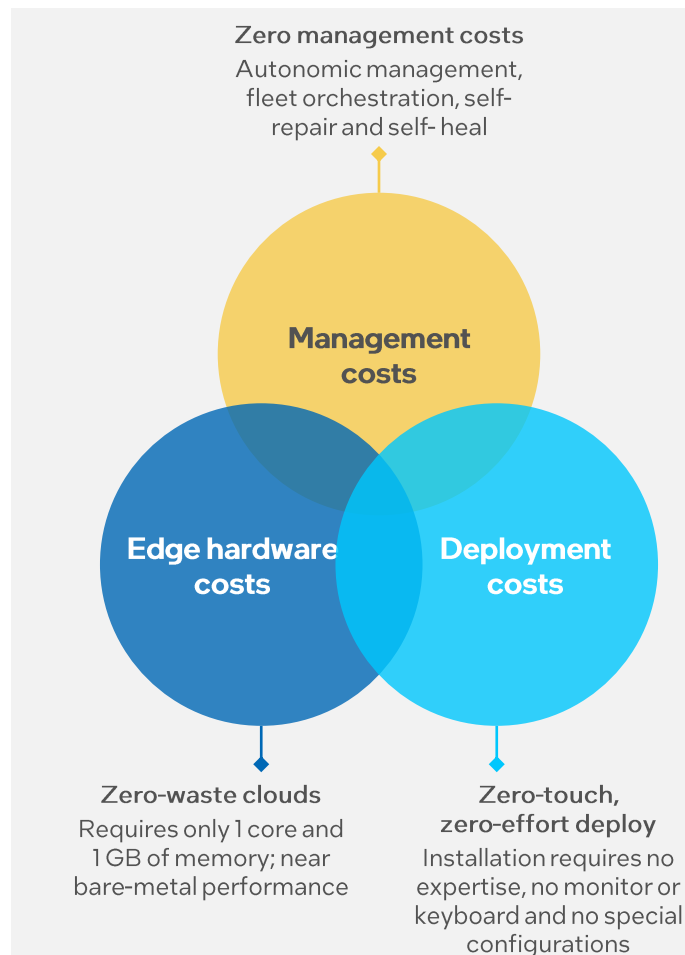
NodeWeaver Stands Out from The Competition

Zero Touch Deployment: NodeWeaver provides an integrated, secure, and patent-pending zero-touch configuration system called DNSOps, which combines the power and ubiquity of DNS with a USB key pre-downloaded installer that brings any hardware from zero to a fully operating private edge cloud in minutes, without requiring customization or user intervention. It enables the deployment of autonomously run compute clusters capable of running multiple virtual machines and container-based workloads, reliably and cost-effectively. One or more NodeWeaver servers automatically combine at each edge location, delivering a cloud-native experience, with reliable and scalable compute and storage for applications.

Autonomous Operation: NodeWeaver's Autonomic Engine empowers edge nodes to handle issues and task execution without any user intervention, even when connectivity is limited or non-existent. All the features of a cloud are available out of the box: high availability, load balancing, storage replication, software defined networks, scripting and API access. Businesses can significantly lower costs by reducing the need for IT expertise or physical intervention.

Simplified Scalability: NodeWeaver adapts itself to the hardware that is available – so it is possible to create clusters with heterogeneous hardware, with no need to adapt or configure anything. Live swapping means that you can replace a faulty system with any available system: no need to be restricted to identical hardware forever. Users can mix hardware within a cluster of nodes or even replace a specific node with new hardware and the system automatically

recognizes the processor, memory, and storage and optimizes/rebalances the cluster to meet the needs of the applications. The extremely lightweight footprint of the NodeWeaver platform – requiring only one physical core and 1 GB of memory - means that you can select the optimal hardware for your use case, without wasting resources.



Ultra-fast Compute: NodeWeaver uses multiple hypervisors that are designed to adapt to specific workloads - full featured ones for traditional workloads like Desktops or POS systems, thin and passthrough-based for Kubernetes and containers. The system automatically deploys the optimal hypervisor for each type of workload, and this allows to run any task with nearly the same performance of a bare metal system.

Intel® Technology Perfectly Complements NodeWeaver's Edge Cloud Software

NodeWeaver's software platform, combined with Intel® Scalable Processors delivers high-performance and scalability for intensive workloads across any compute, storage, and network usages. To help protect data, Intel® Scalable Processors also offer enhanced platform trust technologies and Intel hardware-based security features.

- **Intel® Xeon® Processors:** NodeWeaver delivers enterprise level functionality to execute the most extraneous tasks, whether that is executing traditional virtual machines, Kubernetes, containers, or other typical cloud applications.
- **Intel® Core™ Processors:** NodeWeaver has an encryption library and storage support libraries built into their software to recognize what processor is being used and optimize the hardware to maximize efficiency and speed of executing the application it is running.
- **Intel® Atom™ Processors:** With a small footprint requiring 1GB of RAM and 1 CPU core, NodeWeaver can run on even the smallest of devices and turn multiple Atom-based nodes into highly resilient edge-cloud clusters.
- **Intel® Movidius™ VPU:** NodeWeaver is also capable of taking full advantage of VPU hardware if the customer's hardware and application combination require additional vision processing power.
- **Intel® Distribution of OpenVINO™ Toolkit:** This toolkit is use by customers to further optimize the deep learning and visual inference software applications on top of the NodeWeaver platform to maximize performance.

Industry Example Applications

Telcos



NodeWeaver's nano-cloud technology allows an unprecedented flexibility in telco workloads execution with zero-touch installation that handles deployment with their patent-pending DNSops deployment engine, full nano-cloud cluster management, high availability, and low latency.

AI/Computer Vision



Powering computer vision use cases such as situational monitoring, environmental monitoring, etc., NodeWeaver empowers businesses with real-time execution necessary for live monitoring scenarios.

Retail



Powering future retail trends such as improved customer experiences, digital signage, computer vision, augmented reality, etc. is NodeWeaver's ability to be available for reliable execution, autonomic management, small footprint, and ease of deployment.

Energy & Industrial



With AI, digital twins, and large volume of sensors energy companies have an avalanche of data that NodeWeaver helps manage with reliable execution and soft real-time scheduler for ultra-low decreased latency processing near the edge, and hardware flexibility to scale with additional nodes as you grow.

Delivering Mission-Critical Applications at the Industrial Edge

Customer: Ondulati e Imballaggi del Friuli is a leading manufacturer of corrugated packaging solutions in the EU. They are a critical part of the European supply chain for several Global 1000 CPG companies, as well as a key supplier for many other local customers. Production takes place in four factories that occupy a total area of over 100,000 square meters and uses state-of-the-art machinery to produce corrugated cardboard packaging. Their R&D laboratory creates innovative solutions for delivering greater protection and visibility of packaged goods and company operations are geographically distributed across 3 different cities (Villesse, Venzone, and Cormons) in northeast Italy.

Challenge: Customer needed a highly reliable, agile, flexible, scalable, and performant infrastructure that could be implemented within the constraints of a limited budget and operated/managed without the need for highly specialized personnel. They needed a solution which can run their mission-critical production, R&D, and business applications across multiple sites, as well as the ability to rapidly restore operations in the event of a catastrophic outage.

Solution: Assisted by local partners Office Point and ConsulPartner, customer deployed NodeWeaver Edge clusters in 3 locations. First cluster is located in customer's Main facility (HQ - Villesse), running a number of applications which support global operations as well as local production services, while the second cluster is located at the production site in Venzone, and runs the production control applications which support that facility. Since NodeWeaver is a software-only solution, partners and customer were completely free to select the server type, configuration, and manufacturer which was ideally suited for their requirements, and NodeWeaver's TimeTurner feature is used to backup these environments locally to NAS devices for rapid restoration.

Within the main HQ facility in Villesse, the production cluster runs in one building, and replicates to another building on the campus to provide local DR. The customer had a few older servers which they had previously decommissioned, and given NodeWeaver's flexibility regarding hardware, it can easily extend the useful life of older servers, so the partners simply repurposed that hardware to set up the local HQ campus DR cluster. For wide-area DR, the distance between the two main production sites is approximately 80 km (48 miles) so the production NodeWeaver clusters at these sites are replicating between each other (HQ to Venzone and Venzone to HQ), so each site can quickly failover operations to the other site in the event of an extended outage at either location.

The right choice: The customer is extremely pleased with the results achieved with NodeWeaver and local partners Office Point and ConsulPartner.

“It has exceeded our expectations. After an initial period of calibration and adjustment, we are running in production with all the advanced, enterprise-class features needed to run our mission-critical production operations. We evaluated other platforms and solutions, but none of them could match NodeWeaver's combination of reliability, simplicity, flexibility, and value. We are extremely impressed with NodeWeaver as well as the level of service from their partners Office Point and ConsulPartner.”

- Mr. Adriano Corbatta, Ondulati e Imballaggi del Friuli EDP Manager.

— Try NodeWeaver and Get Started on Elevating Your Business Operations —

With all the data generated at the distributed edge network, NodeWeaver Edge Cloud is the solution that eases edge infrastructure deployment for any organizations needs. Whether for a small or large business use case, NodeWeaver Edge Cloud brings the power of the cloud to the local edge with zero-touch deployment, a unified compute, storage and networking platform, and centrally managed, autonomically healing system to power any application for any workload size.

Contact at nodeweaver.eu/contact NodeWeaver to see a live demonstration and try their Edge Cloud solution.

Learn More

To learn more about the NodeWeaver Edge Cloud visit:

- [The NodeWeaver Website](#)
- [NodeWeaver IoT/Edge Clouds PDF](#)
- [NodeWeaver Edge Cloud Fabric-pitch deck](#)
- [Higeco Energy Case Study](#)
- [Supermicro – Retail Implementation – Solution Brief](#)
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About NodeWeaver

NodeWeaver is a software-defined “nano-cloud” operating platform that simplifies the deployment, management, and orchestration of infrastructure and applications at the distributed edge. NodeWeaver’s technological advancements originated as part of a set of European Commission funded research projects whose goal was to help companies become more resilient in the face of natural and man-made disasters. From there, NodeWeaver found that it solved the problem of managing applications at the edge and providing reliability simultaneously. To meet the needs of not only large enterprises but also the small business centric environments comprising of much of Europe, NodeWeaver created their solution to bring all the benefits and capabilities of a hyperscale cloud down to the edge that adapts to the wide range of needs and use cases. NodeWeaver has customer installations and partners in 15 countries, and across several verticals including manufacturing, energy, retail, and travel.



1. IDC FutureScape, [Worldwide Future of Digital Infrastructure 2021 Predictions](#), 2020
2. Exploding Topics, [80+ Amazing IoT Statistics](#), 2022
3. TechTarget, [5 edge computing trends to watch in 2022 and the future](#), 2021

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