SOLUTION BRIEF

EASILY CONNECT AND MANAGE MANUFACTURING FLOORS WORLDWIDE WITH SUPERMICRO AND TTTECH

Nerve Blue – An Open Software Platform explicitly designed for Industry 4.0

SYS-E100-9AP-IA

SYS-1019D-FHN13TP

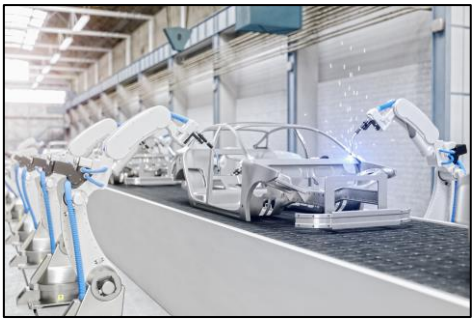
TABLE OF CONTENTS

SUPERMICRO

As a global leader in high performance, high efficiency server technology and innovation, we develop and provide end-to-end green computing solutions to the data center, cloud computing, enterprise IT, big data, HPC, and embedded markets. Our Building Block Solutions® approach allows us to provide a broad range of SKUs, and enables us to build and deliver application-optimized solutions based upon your requirements.

Executive Summary

Until now, industrial operations have been heavily reliant on inflexible, proprietary solutions that have limited their ability to update and improve machine applications at the Edge efficiently. Nerve Blue is a radically open software platform that enables machine builders and plant operators to manage software running on Supermicro devices remotely from the cloud. This empowers businesses to improve machine or plant performance and reduce the cost and complexity of industrial automation.



The Challenges Manufacturers Face

Today, manufacturers must adapt to a changing technical landscape, where metrics for equipment performance and efficiency can provide insights that improve the bottom line and provide sustainability. If you are facing one or more of the following challenges, Nerve Blue on Supermicro edge devices will change the way you operate:

- Maintaining software on devices at the Edge is time-consuming and costly
- No consistent, global overview of the software installed on your entire fleet of edge devices
- Proprietary solutions are constraining the use of best-in-class software from independent vendors
- Installing or replacing edge devices requires intensive on-site work
- Updating and upgrading software becomes more complex as your systems grow
- Migrating legacy software from end-of-lifecycle hardware is complicated and costly

Introducing Edge Computing

Edge computing devices provide decentralized computational capacity on the shop floor, where machine data is generated. In a smart factory's edge computing architecture, cloud services are still available for consolidating large amounts of data, however, servers can be expensive to operate, and issues around latency and security can arise. Edge computing offers a local alternative where machine data is collected, stored, and analyzed at the source. The data is therefore available in real-time, and it is actionable, i.e., available for immediate use for operating the plant, optimizing processes, or preventing accidents. Edge devices can select the data needed for taking immediate actions. Once the operation has concluded, the edge device can discard data that is no longer needed or pass some or all of it on for storage and further analysis in the cloud.

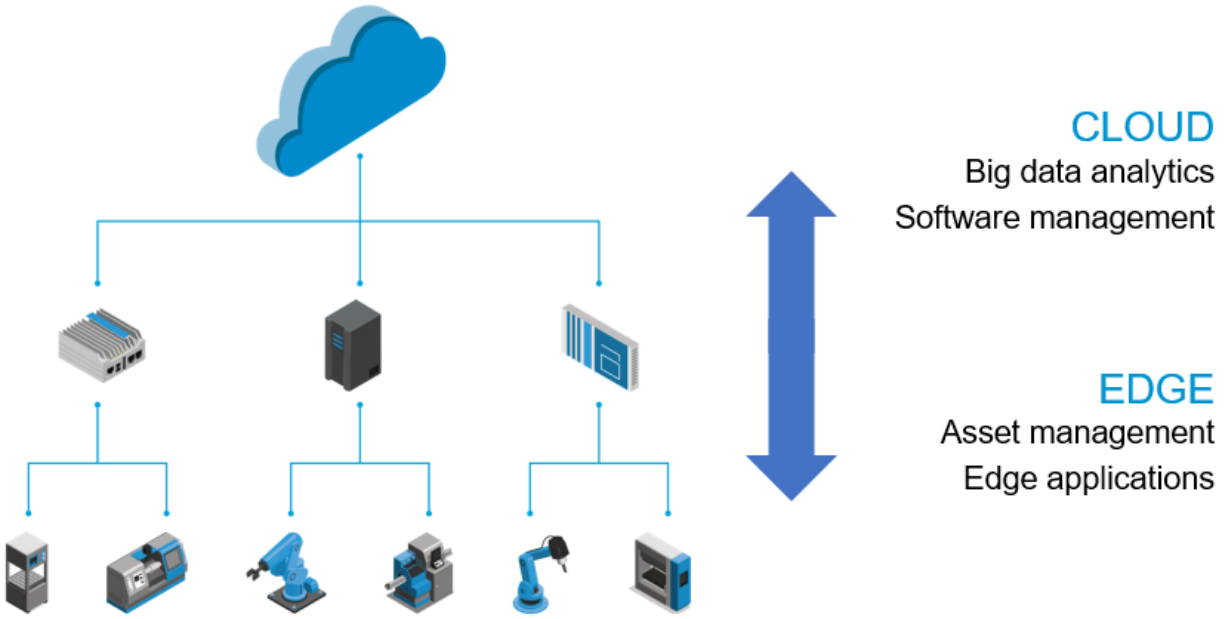


Figure 1 - Edge Applications to Cloud Management

SUPERMICRO SERVERS FOR NERVE BLUE

SYS-1019D-FHN13TP

SYS-E100-9AP-IA

SYS-5029C-TN2

Supermicro servers validated and qualified with Nerve Blue

Introducing Nerve Blue on Supermicro Hardware

Nerve Blue is a highly flexible edge computing platform that runs on Supermicro edge hardware. Its open architecture provides the infrastructure needed to run and remotely manage software on the shop floor and deliver production data securely to the cloud. System information and software management features are available via an intuitive user interface accessible at the edge or in the cloud.

Nerve Blue is specifically designed for industrial environments. In a typical application scenario, hundreds of Supermicro devices running Nerve Blue are located on machines in production facilities worldwide. Nerve Blue enables local connection to the various sensors and IOs on your machines and remote connection to the central Nerve Management System, which provides an overview of your entire fleet of devices and enables you to manage them.

Nerve Blue provides a uniquely open platform for software applications. It offers you the flexibility to run Docker containers, Virtual Machines, and IEC 61131-3 PLC applications parallel to one device. Typical applications include Windows Virtual Machines that run HMI or SCADA applications, Docker containers running predictive maintenance code, or 61131-3 applications connected to fieldbus devices or control machines. Beyond this, Nerve Blue also provides a suite of Data Services that enable you to connect, collect, store and visualize data at the edge and in the cloud.

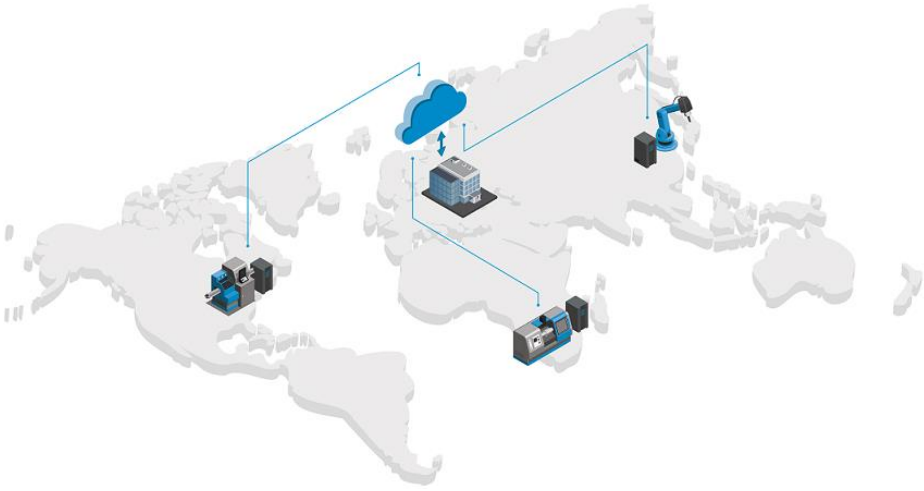


Figure 2 - Machines Connected Worldwide to a central HQ

Nerve-Qualified Supermicro Devices

Edge Device	Processor	RAM	SSD/HDD
SuperServer 1019D-16C-FHN13TP	Intel® Xeon® D-2183IT	32 GB	2x 256GB
SuperServer 5029C-T	Intel® Core™ i3-8100	16 GB	HDD 2x 1TB
SuperServer E100-9AP-IA	Intel® Atom® x5-E3940	8 GB	HDD 2x 1TB

Why Supermicro Edge Devices?

Supermicro Fanless Edge devices such as the SuperServer SYS-E100-9AP-IA are the ideal solution to address the demands of Industrial applications. The E100-9AP-IA provides legacy connectivity such as COM ports for RS-232/422/485 interfaces to bring management capability to existing manufacturing equipment. Easily DIN rail mounted within the equipment or remotely for convenience of installation, this fanless system is built to withstand the environmental conditions found in manufacturing facilities. With connectivity being an essential requirement for Nerve Node functionality, this system provides two Gigabit Ethernet ports and an expansion slot to add additional Ethernet and many other connectivity options for add on modules.

The fanless system brings management and control capabilities to the equipment. The SYS-1019D-FHN13TP provides the compute functionality for the Nerve Management System, tying in all of the devices throughout a manufacturing facility. Based on the Intel® Xeon®-D SoC (System on Chip), the 1019D series of products offer superior performance in a long availability platform. With up to 16 CPU cores per device, the 1019D can serve as the node device for many individual systems or machines and run the management system for those devices. With 13 Ethernet connections and expansion capabilities to add, even more, plant operators can manage their entire facility or functional branches of their process with a single device, saving equipment cost and management effort.

Another aspect of the connected factory is the storage of the data generated by the systems and sensors. To help manage this, TTtech utilizes the Supermicro SYS-5029C-TN2. This mini-tower system supports four hot swap, front-loading 3.5 inch storage bays. With support for Intel Core i9 down to an Intel Core i3, this system provides the storage required in connected factory applications and offers a high level of computing capability to perform operations on that data or offload other critical tasks in the factory. These products from Supermicro are part of the Embedded product lineup, allowing operators to choose a system with the confidence that it has the required features and will be available and supported for long life and availability.

Benefits of Using Nerve Blue on Supermicro Edge Devices

Nerve Blue offers a unique approach to edge software management, with features that can be combined with Supermicro edge devices to address real-world use cases found on the manufacturing shop floor:

- **Ease of use:** Nerve Blue's software management workflow provides an optimal balance between IT administrators and the non-IT personnel on the shop floor. Software configuration parameters are set by IT administrators and encapsulated before deployment to reduce complexity for shop floor staff. The intuitive user interface then makes software deployment easy and minimizes the chance of user error.
- **Open ecosystem:** Nerve Blue places no restrictions on which software can be hosted on your Supermicro edge device. Existing legacy applications can be hosted alongside newly developed solutions, and software can be sourced from automation specialists, 3rd party developers, or in-house.
- **Variety of application types:** Nerve Blue supports a unique range of software formats. Applications can be hosted not only as Docker containers but also within Windows or Linux virtual machines (VMs). In addition, real-time

applications are supported via an integrated soft PLC (CODESYS). This allows the hosting of 61131-3 compliant, industrial real-time applications.

- **Open interfaces:** Nerve Blue deeply integrates open-source software. The Hypervisor, Operating System, database, and visualization services are all open and standards based. Open APIs are provided for integration into your continuous integration (CI) / continuous development (CD) pipeline.
- **Comprehensive system overview**: Nerve Blue offers IT-style monitoring and logging for industrial software. Pre-configured dashboards can be used to view centrally logged data from your entire fleet of devices, providing a complete system status overview.
- **Offline operation**: Nerve Blue enables all operations also to be carried out locally. As mandated by many shop floor use cases, the system features are fully available via a local user interface if there is no connection to the cloud. Edge devices can operate autonomously for extended periods of time before reconnecting to the Nerve Management System.
- **Consolidation of devices:** Nerve Blue reduces the number of devices needed on the shop floor. Several virtual machines and containers can be hosted on one Supermicro device when running Nerve Blue. Consolidating so many functions on one piece of hardware reduces hardware costs, required space, and system complexity.

Solution Overview

Nerve has two main elements: the centralized Nerve Management System and the Nerve Node software installed on each Supermicro device.

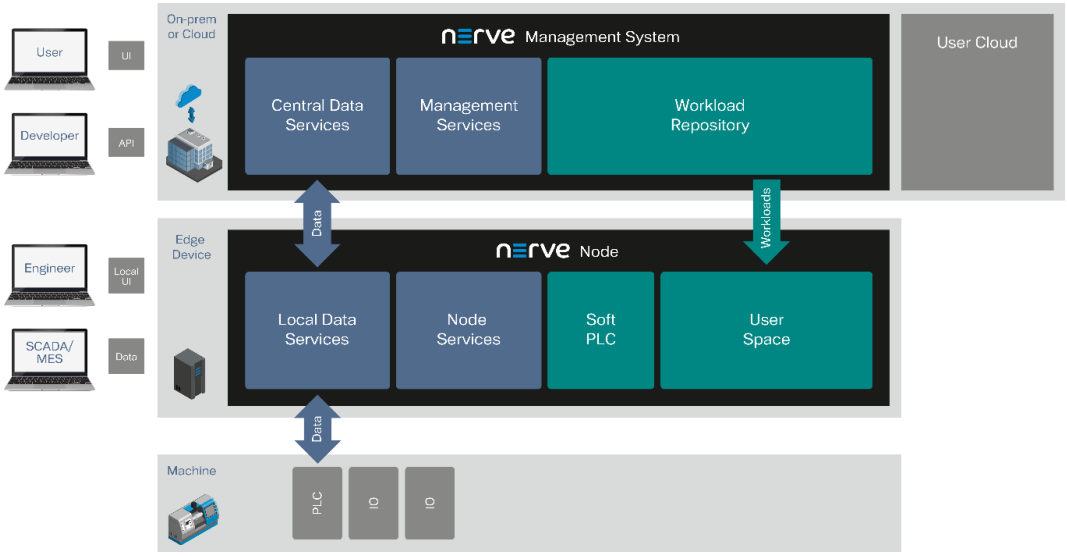


Figure 3 - Nerve Main Elements

Nerve Node	•Nerve Node software is installed on an edge device. The system is Linux based with a User Space that makes use of a real-time hypervisor and Docker container support. In addition, Nerve Node software contains all services for communication with the Management System, remote access, logging, monitoring and patching.
Nerve Management System	•The Nerve Management System is an on-premise or cloud-based software for central management of connected nodes. It enables users to update Nerve Node software and deploy workloads, as well as offering remote connection to nodes for device monitoring and central logging.
User Space	•The User Space is the place where all user applications (known as workloads) can be installed and run on nodes. Workloads can be Docker containers, Virtual Machines or CODESYS 61131-3 Soft PLC applications.
Workload Repository	•The Workload Repository holds the workload images and configurations that are available to deploy to nodes. Here, users can define settings and parameters for each workload. It also supports versioning of workloads for application updates
Data Services (Local and Central)	•Data Services are a collection of features supporting users with data connectivity, storage and visualization. A multi-protocol data gateway is available on each node. Data storage and visualization are available on each node and in the Management System. The integrated Soft PLC can also be used to connect to fieldbus devices. Nerve Blue comes with an SDK to easily create Python applications that communicate with the Data Services
Soft PLC	•Nerve Blue integrates a CODESYS soft PLC supporting PROFINET, EtherCAT and Modbus protocols at cycle times down to 1ms. Using the Soft PLC users can collect data and pre-process in IEC 61131-3 languages or run control applications for machines
Management Services	•Management Services comprise all features that enable users to remotely manage their fleet of devices in the field. Management Services include device monitoring, centralized logging, remote screen viewing and remote network access, which offers similar functionality to an integrated VPN
Node Services	•Node Services are installed on Nerve Nodes and act as the counterpart to the Management Services. Node Services include the software components necessary to enable remote monitoring, logging, and remote access from the central management system. Node Services also provide the local graphical management interface (Local UI)
Nerve Management System API	• The Nerve Management System can be controlled via an API to enable automation of repetitive tasks or integration in a CI/CD pipeline.
Nerve Management System UI	• The Nerve Management System User Interface provides an intuitive overview of all central Management System functions
Local UI	• The Local User Interface provides manageability of individual nodes in case access to the central Management System is not available.

Figure 4 - Nerve Blue Functional Descriptions

Conclusion

Running Nerve Blue on Supermicro edge devices helps to solve several challenges faced by manufacturers today. By enabling remote management of software installed on Supermicro devices, Nerve Blue allows users to reduce response times and maintenance costs. Installation of new devices and software can also be achieved with just the click of a button with Nerve Blue. Nerve Blue allows entire legacy software environments to be easily migrated from end-of-lifecycle hardware to a Supermicro edge device. Finally, Nerve Blue provides an open platform for running best-in-class software from independent vendors, with a global overview of the software installed on your entire fleet of Supermicro edge devices.

TTTECH INDUSTRIAL

TTTech Industrial develops innovative computing and connectivity solutions that help customers to modernize automation systems and become IoT leaders in their field. The company integrates open, standard technologies to offer flexible platforms for connecting, controlling and managing machines.

TTTech Industrial operates under the umbrella of the TTTech Group, a technology leader in real-time networking and safety controls, with cross-industry experience from more than 20 years of operation. The company is based in Vienna, Austria - ideally situated in Europe's manufacturing heartland.

Get started with Nerve on Supermicro today

Nerve Blue is a proven in-use solution that fits perfectly with your Supermicro edge device. Start your free 30-day trial of Nerve Blue now. Go to www.tttech-industrial.com/try-nerve to begin your journey with the Nerve Blue online demo or contact trynerve@tttech-industrial.com.