Nerve Blue is a radically open edge computing platform that promotes vendor independence and flexibility. Its open architecture allows users to deploy their own software or applications developed by 3rd parties. With Nerve Blue, users can reduce system complexity and cost, improve machine performance, and offer innovative new services to customers.

<table>
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<th>Collect, store and analyze machine data</th>
<th>Consolidate multiple functions on one device</th>
<th>Manage and deploy software</th>
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<tr>
<td>Real-time data access from PLC and IO infrastructure</td>
<td>Virtualized environment running Windows or Linux virtual machines</td>
<td>Central repository for containers, VM and CODESYS® programs</td>
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<td>Time-series database integrated in device software and in the Management System</td>
<td>Support for lightweight Docker containers</td>
<td>Simultaneous deployment of workloads to multiple devices and locations</td>
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<td>Datapath functionality for manipulating and distributing data between different systems</td>
<td>Soft PLC (CODESYS®)</td>
<td>User management for device and software configuration</td>
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<tr>
<td>Local and web-based user interface for data visualization</td>
<td>Converge hardware based functions in software</td>
<td>Remote screen and console access to devices and installed software</td>
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</table>

### Nerve Blue Software
One-time license per Nerve Device

- VM and container hosting
- Local UI
- Time-Series Database
- Local data processing
- Real-time data manipulation
- Soft PLC

### Qualified Nerve Device
One-time purchase

- TTech MFN 100, Kontron A-250/A-150, Siemens Simatic IPC 127E/427E, Vecow SPS 5600
- Qualification of other Nerve Devices available on request

### Management System
Monthly fee per active Nerve Device

- VM and container deployment
- Data streaming to the cloud
- Cloud interfaces
- Global device management
- OTA patches and bugfixes

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Base System

**Base System**
Debian 10 (Linux Kernel 4.19.0)
Support for Atom, Core i5 and i7 based COTS hardware (qualifiable as Nerve Devices)

**Hardware Support**
TTT ech MFN 100, Kontron A-250/A-150, Siemens Simatic IPC 127E/427E, Vecow SPS 5600

**Hypervisor**
Xen 4.11

**OS Support**
Linux and Windows (as virtual machine)

**Soft PLC**
CODESYS 3.5 (PROFINET Master/Slave, EtherCAT, Modbus TCP/IP), Cycle time down to 1ms
Hosted in a real-time virtual machine to ensure isolation

**Workload Management**
Local UI for Workload management
Resource management to ensure application performance

**Extensible Architecture**
Open for integration of 3rd party software firewalls (e.g. CISCO vASA)

**Updates**
Over-the-air updates, security patching and bug fixes for Base System

**Communication Security**
Encrypted Transport Layer Security (TLS 1.2) based communication
Firewall friendly - communication to the Management System uses port 443

**Application Sandboxing**
Applications are hosted as virtual machines and containers to maintain system separation

**Network Segmentation**
Configurable networking for separation of workload networks

Datapath

**Database**
Timescale Time-Series Database (optional InfluxDB)

**Datapath**
OPC UA with Authentication support
High speed data ingestion: 100,000 data points per second
Time stamp support in data-stream and at ingestion point

**Input Protocols**
MQTT / JSON, OPC UA Client/Server, OPC UA PubSub

**Output Protocols**
MQTT / JSON, OPC UA Client/Server, OPC UA PubSub, Timescale DB (SQL), InfluxDB

**Data Visualization**
Grafana locally on Nerve Device and remotely in Management System

**Analytics**
Python SDK and toolchain for analytics container creation
Analytics support built with Intel MKL and DAAL libraries

Management System

**Hosting**
Hosted on Azure cloud or on-premises

**Management System**
Deployable as Linux Docker with browser-based GUI
View status of connected Nerve Devices, secure onboarding of new Nerve Devices
Supports low bandwidth and intermittent connections to Nerve Devices

**Workload Management**
Workload management (deployment and updates) remotely via Management System
Selective application deployment to mitigate user error
Workloads accessible from the external network
Support for local repositories (service PC or server)

**Database**
Timescale Time-Series Database

**Data Visualization**
Grafana via Datapath

**Permission Management**
Fine grained role-based access control to Management System
LDAP support, OAuth 2.0

**Remote Access**
Remote service access (VNC, RDP Shell), remote port tunneling (e.g. for FTP)

**Logging and Monitoring**
Centralized logging support (Elasticsearch/Kibana)

**Alarms**
Alarms created through Grafana (RAM, CPU, temp. status & certificate expiry warning)

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