GE VERNOVA

EDGE SOFTWARE & SERVICES

EDGE

Frequently Asked Questions

GE VERNOVA

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doc@ge.com

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General

What is edge technology?

The edge is the frontier of embedded systems and the applications they run, ranging from hefty server infrastructure to bare-bones field devices, and from oil rig monitors to the controls for aircraft engines. In the Industrial Internet context, Edge computing represents a new architecture and set of capabilities that are differentiated from legacy on-premise applications and gateways because of recent technology advances such as low-cost computational power, virtualization technologies, ubiquitous, standards-based connectivity, and advances in cybersecurity.

These new capabilities lie at the heart of offerings that drive transformational outcomes for industrial customers:

- More cost-effective, cloud-enabled applications enabled by preprocessing and filtering data at the edge.
- Improved productivity and performance derived from a new generation of analytics and applications at the edge that has not been available before.
- Faster time to market for modern software-based offerings and analytics enabled by a modular architecture and full ecosystem of app development and deployment, and edge management capabilities.

What is the difference between Predix Edge and Predix Edge OS?

Predix Edge is the brand name of the new software stack offered by GE, built under the Edge 2.0 initiative. During the development phase, Predix Edge OS was the informal name used by development teams to refer to the Yocto OS used within the Predix Edge stack. The OS within the Predix Edge stack has not been formally branded and is simply referred to as secure OS.

What is a Predix Edge VM? Why would I need an Edge VM?

Predix Edge VM is a ready to run Predix Edge on any hardware that supports ESXi 6.5 Virtual Machine. This is extremely useful for customers with a preference of particular vendor hardware and also makes it easy for adopting and deploying Predix Edge-based solutions. As this is on a virtualized platform, customers can use the same hardware to run other VMs alongside Predix Edge VM. This is easy to use and is agnostic to any particular hardware OEM. Predix Edge VM is ideal for running and hosting large complex analytics applications or have the need to ingest and process large volumes of data at maybe a centralized location.

Can I deploy Predix Edge on a device of my choice?

Predix Edge supports Intel and ARM architectures.

There is also an Ubuntu version of Edge Agent available that allows customers to quickly deploy their own Predix Edge enabled devices. However, this version does not benefit from the ability to improve the security, stability, and maintainability of the system through Predix Edge OS. A few key features are not supported on the Ubuntu version of Edge Agent, most notably the Predix Edge Technician Console (PETC) used for local, web-based management of a single device.

Note:
The only version of Ubuntu supported is 18.04 LTS, and only for Intel/AMD processors (amd64/x86_84).

Can/when can I run Predix Edge on Windows?

Predix Edge GA release supports only Linux.

What is included in Predix Edge?

Predix Edge is a contemporary platform for applications that runs at the intersection of industrial control systems and the industrial Internet. You can use Predix Edge to send industrial asset data to the Predix Cloud or to deploy new applications to run in close proximity to an industrial control system.

Predix Edge is composed of several systems that work together:

- **Predix Edge OS** is a hardened Linux operating system that includes a container engine, a data plane for multi-container applications to share data, a protocol translator, a technician console for enrollment and management of the OS and applications running therein, an edge-to-cloud gateway for piping data to Predix Cloud services and an Edge Agent (described below).
- **Predix Edge Agent** manages network interactions between the Predix Edge OS and both Edge Manager and the Predix Edge Technician Console.
- **Predix Edge Manager** makes it easy to manage edge devices at scale. With Edge Manager, you can rapidly deploy multi-container applications and configurations to your edge devices and deploy configurations. The Intelligent Data Pump enables you to painlessly configure a data gathering application through a user-friendly interface.

What is the difference between Predix Edge and edge technology from other vendors?

Many other vendors have pieces and parts that an integrator is required to assemble and test. GE Digital provides a complete solution from soup-to-nuts including an industrial grade, hardened OS, protocol support, gateways to send data to the cloud, a data broker for sharing information between containers, an agent that talks to Edge Manager and an Edge Management capability that simplifies deployment and management of edge systems at scale.

Do I need to send my data to the Predix Cloud?

No, you are not required to send data to Predix Cloud, although you can if desired.

Getting Started

How do I deploy Predix Edge?

Instructions for accessing and deploying Predix Edge to VMWare ESXI, VMWare Fusion (Mac), VMWare Workstation (Windows) are available here *(on page)*.

How do I enroll my device?

Prerequisites:

- Edge manager tenancy.
- Predix Edge image.
- Internet connectivity.
- Corporate proxies (Check with your Network Administrator if you need assistance).

1. Edge Manager – Go to the Device tab and add your device.
2. From the Predix Edge Technician Console:
    - Device configuration including time settings, proxy settings, network settings.
    - Input your device id, shared secret and Edge manager URL.
    - Choose enroll option.
3. Edge Manager – Confirm device is enrolled by checking that it is online in the status window.

How does GE Digital support Predix Edge? Who can I call if I have a problem?

GE Digital provides Tier 1, Tier 2 and Tier 3 support for the Predix Edge Virtual Machine Image and packaged Predix Edge application services. We also provide support for GE embedded systems engineering teams to build their own image to embed in custom or third-party devices, with the following caveats:

- We will provide support for the production code from which the image is built. However, support for the resulting image and additional integration code (e.g., board support packages) is the responsibility of the GE team who created the build.
- We do not support any modifications to the source code itself (i.e., forking of the standard code base).

The End Customer support plan for GEBU apps and solutions enabled by Predix Edge is the responsibility of the GEBU product team to define and manage.

Support Process

The support plan for Predix Edge follows GED's standard process, which is documented at the GE Digital support website.

Acceleration Plans will be made available post-GA. Contact the Predix Edge product management team in the event of customer requests for enhanced support.

A System Builder kit and commercial developer support plan will be made available post-GA. Contact the Predix Edge product management team in the event of customer requests for more dedicated pre-sales Predix Edge support.

Why can't I get a network on BLUESSO?

If you are unable to connect your device to your network, check the following:

- Are you on Wi-Fi or physically connected to a network?
- Make sure your device is up and running.
- Ensure your hypervisor Network Address Translation (NAT) is sharing your host IP address.
- Ensure your proxy settings are correct.
- Is there a firewall? If so, do you have access to get through the firewall?

Predix Edge Applications

What protocol translators and cloud gateways come out of the box with Predix Edge?

Predix Edge ships with protocol translators for OPC-UA, Modbus, EGD, OSI-Pi and MQTT and comes with cloud gateways for sending data to Predix Time Series and Predix EventHub.

How do I access the Predix Edge stock apps like protocol translators and cloud gateways?

Instructions for accessing the protocol translators and cloud gateways are available here *(on page)*. Additionally you'll find sample configurations there.

How do I configure protocol translators and cloud gateways?

For configuration instructions see:

- Protocol adapters *(on page)*.
- Gateways *(on page)*.

How should I write Predix Edge applications?

We have taken an open approach to developing apps for Predix Edge. As long as your app can be containerized to run in Linux Docker, your app can be deployed to Predix Edge. If your app requires connectivity to other apps or Predix Edge components such as protocol adapters or cloud gateways, the only requirement is the ability to connect to MQTT. MQTT client libraries are available for most languages you would consider for app development.

There are a few security constraints you must follow when designing your app. First of all, you are not allowed to define arbitrary volume mounts for disk access on the Predix Edge device. Disk access is restricted to a /config and /data folder automatically provided to each app. The config folder is read-only and contains configuration files uploaded to your app from either Edge Manager or PETC. Your app should be designed to load startup configuration files from this location. The Data folder is read-write and must be used for any file IO in your application.

To connect to the MQTT Broker for inter app communication, your application must be configured to attach to the `predix-edge-broker_net` Docker network. This is configured in the app's `docker-compose.yml` file.

Predix Edge provides sample applications in C++, Java, GO, NodeJS and Python. Each application has a full set of instructions on how to design, code, build and deploy the app to Predix Edge. Links to these apps can be found in the Predix Edge documentation at www.predix.io.

How do the /config and /data volume mounts work?

When you deploy an application using either Edge Manager, the curl command from the Edge OS command prompt, or PETC, the Predix Edge Agent does some behind the scenes magic to your docker-compose file to create a read-only /config mount that your applications will be able to access for configuration information and a /data volume mount that your applications can use for read/write AKA sandboxed config and persistent storage.

Some recommended do's and dont's:

Do

- Write your application logic to look for configuration logic in the /config directory.
- Write to and read from the /data directory in your application logic.

Don't

- Create the volume mounts in your docker-compose files. Edge Agent will do that for you and will choke if you try to do it. (This is for sandboxing purposes.)
- Look for a /config directory on the predix OS instance, you will not find it there. If you are looking for where to put those config files because you are doing it manually on the Dev VM, then you want the `/var/lib/edge-agent/app/your-app-id/conf/` directory, which mounts to the Docker app's /config directory.
- Try writing to the /config directory in your app logic, it is a read-only mount.

The curl command to deploy the application is:

```
$ curl http://localhost/api/v1/applications --unix-socket /var/run/edge-core/edge-core.sock -X POST -F
 "file=@/mnt/data/downloads/app.tar.gz" -H "app_name: your-app-id"
```

Note:
The above curl command will initialize the /config and /data directories.

For more information on application packaging and deployment, see Packaging and Deployment *(on page)*.

Can I retrieve log information from the OS and from my apps?

Yes, see the logging documentation *(on page)* for more information about retrieving logs using journalctl, PETC and Edge Manager.

Predix Edge Configuration

What do I need to create a Predix Edge environment?

You can run the Predix Edge development Virtual Machine on VMWare ESXi, VMWare Workstation or VMWare Fusion. We recommend you write your custom apps in a Linux or Mac environment and **test** them on the Predix Edge dev instance.

What are the recommended hardware requirements for Predix Edge?

For Predix Edge running natively on hardware, without virtualization support, customers need at least two cores (Intel x86 or ARM core) with 2 to 4 GB of memory with 256 GB of storage. This basic configuration will help customers with small devices acting as data gathering, processing and sending to cloud (aka Intelligent Data Pump) use case. If customers want to also develop streaming analytics that process near real-time data from the machines to extract performance indicators or optimize operations by writing back to control system logic, a more powerful hardware configuration is required. This will be determined by the complexity of the Edge application running on the platform. For the Predix Edge VM, the recommended hardware configuration is four CPU Cores that support virtualization, 8GB of memory and at least 256 GB of storage with a network interface card.

What is the maximum bandwidth of data from field to cloud?

The throughput performance of Predix Edge is highly dependent on the configuration, applications, protocol adapters and hardware. As GED makes available Predix Edg-enabled, standard turnkey hardware, we will provide performance numbers for typical use cases to help guide hardware selection and support customer Q&A.

How do I know my data is in the Predix Cloud?

Use the Predix Tool Kit or Postman.