



GE PulseNET Standard  
**Installation Guide**

Version 4.5.0



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## Planning Your Installation

### System Requirements

Before installing GE PulseNET, ensure that your system meets the following minimum hardware and software requirements. Virtualized environments are also supported.

- **CPU:** Quad Core at 2 GHz or greater
- **Memory:** 16 GB or greater of available memory
- **Disk Space:** 120 GB or greater of available storage
- **Java:** Ensure that Java 8 or newer is present in order to run the GE PulseNET installer. You will be prompted to install Java if the GE PulseNET installer detects that it is not present on your server.

**Note:** Each environment can behave differently depending on how often devices are polled and other variables. For environments with greater than 5000 devices, please contact GE Support for proper system sizing.

### 64-bit Operating System Support

- **Windows 7** (SP1 with Convenience Rollup), **Windows 10 Pro**
- **Microsoft Windows Server 2008 R2 Standard SP1**, 2012/R2 or 2016
- **RedHat Enterprise Linux** version 7 or greater
- **SuSe Linux Enterprise Server** version 11 or greater
- **Note:** PulseNET has only been fully tested on English language OS versions; International languages of OS versions have not been fully tested

### Web Browser and Web Client Support

- **Chrome** (version 55 or newer)
- **Firefox** (version 52 or newer)
- **Internet Explorer 11** or **Microsoft Edge 41.16299.402** or greater

### Device Support

The following GE MDS devices can be monitored by GE PulseNET (minimum firmware version in parentheses):

**EntraNET** (3.0.7), **iNET-900** (6.9.1), **iNET-II** (2.9.1), **Intrepid** (1.9.00 b1730), **Mercury 1800** (3.0.6), **Mercury 3650 D** (3.7.3), **Mercury 3650 E** (3.2.6), **Mercury 5800** (3.0.6), **Orbit** (6.1.2), **SD Master Station** (3.2.5), **SD Series** (4.1.5), **TransNET 900** (3.2.3), **WiYZ** (1.5.5), **x790** (2.2.1), **x710** (3.7.1).

## Firewall Configuration Rules

Firewall rules should be established which allow only workstations to connect to the PulseNET server on the services listed in the following table:

Function	Access	Port Number	Traffic Direction	Protocol
HTTP	External	8080	Inbound	TCP
HTTPS	External	8443	Inbound	TCP
AJP	Internal	8009	Inbound/Outbound	TCP
Shutdown	Internal	8005	Inbound/Outbound	TCP
Database	Internal	27017	Inbound/Outbound	TCP
SNMP	External	161	Outbound	UDP
Email	External	25	Outbound	TCP
ICMP	External	ICMP	Outbound	ICMP
FTP	External	21	Outbound	TCP
TELNET	External	23	Outbound	TCP
Heartbeat	External	61616	Inbound/Outbound	TCP
Netconf	External	830	Outbound	TCP
DLINK	External	9999	Outbound	TCP

**Internal:** This port is only used internally on the GE PulseNET server.

**External:** This port provides communication with other systems. Ensure Firewall is configured to allow port access.

**Telnet:** Used by Mercury and iNET radios

## Network Requirements

In order for GE PulseNET to operate correctly on your server, ensure that you have a static host name and that the server's IP address can be resolved consistently using that host name.

## System Recommendations for Optimal Database Performance

GE PulseNET uses MongoDB as a cross-platform document-oriented database program. The installation recommendations for MongoDB are listed below under **General Recommendations**, **Linux**, **Windows**, and **Virtual Machines**. If you have any further questions, you can review the full MongoDB documentation on the MongoDB website.

**Production Notes:** <https://docs.mongodb.com/manual/administration/production-notes>

**Production Checklist:**

<https://docs.mongodb.com/manual/administration/production-checklist-operations>

### General Recommendations

- An SSD is recommended, using the noop or deadline disk schedulers for SSD drives
- If using RAID, use RAID-10
- Enterprise-grade hardware is recommended
- Do not run on NUMA hardware
- Ensure that your system has sufficient swap-space configured

### Linux

- Use Linux kernel version 2.6.36 or higher
- Use XFS or EXT4 only
- Turn off atime
- Set the file descriptor limit and the user process limit (ulimit) above 20,000
- Disable Transparent Huge Pages
- Disable defrag
- Disable NUMA in your BIOS
- Set the readahead setting to 0
- Use noatime for the dbPath mount point.
- Configure sufficient file handles (fs.file-max), kernel pid limit (kernel.pid\_max), maximum threads per process (kernel.threads-max), and maximum number of memory map areas per process (vm.max\_map\_count) for your deployment. For large systems, the following values provide a good starting point: fs.file-max value of 98000, kernel.pid\_max value of 64000, kernel.threads-max value of 64000, and vm.max\_map\_count value of 128000
- Ensure that the system default TCP keepalive is set correctly. A value of 300 often provides better performance for replica sets and sharded clusters

### Windows

- Use NTFS only
- Disable NTFS 'Last access time'
- Use SetSystemFileCacheSize to limit file system cache memory (less than 40%)

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### **Virtual Machine**

- VM must have dedicate memory. Map and reserve the full amount of memory for the virtual machine running MongoDB. Avoid dynamic memory features, such as memory ballooning.
- Ensure that virtual machines stay on a specific Host by setting affinity rules.
- CPU reservation must not exceed more than 2 virtual CPUs per physical core
- Ensure each mongod has provisioned IOPS for its dbPath, or has its own physical drive or LUN
- Disable the tuned tool if you are running RHEL 7 / CentOS 7
- Use the noop disk scheduler for virtualized drives in guest VMs

### **Clusters / Replica Sets**

- Use NTP to synchronize the clocks on all components of your cluster
- All replica set members must be identically provisioned: RAM, CPU, disk, network setup, etc.
- Avoid placing all replica set members on the same SAN, as the SAN can be a single point of failure.

# Installing GE PulseNET

## Initial Considerations

GE PulseNET should run on a dedicated machine because it will process and store large volumes of data. Before beginning your installation, verify that you have full administrator access to your server's operating system.

Once you have downloaded the GE PulseNET installer file, take steps to prevent your antivirus software from scanning the GE PulseNET folder (example: C:\GE\_MDS) and sending you false positive alerts or locking the files or folders. Add the GE\_MDS folder to the **Exclusion List** of your antivirus software before beginning installation of the GE PulseNET software. Consult your specific antivirus software guide for detailed instructions on adding folder exclusions.

After the installation completes, you should change the default GE PulseNET 'administrator' and 'operator' account passwords. The default username and password (admin/admin) will initially be used to log in to the browser interface and use GE PulseNET command-line tools with administrator privileges. It is strongly recommended that you change the default passwords for these accounts after installation.

## Installing GE PulseNET on your Server

Verify that your machine(s) meet the minimum system requirements for the number of devices GE PulseNET will be monitoring.

### Step 1: Running the Installer

Locate and run the GE PulseNET install file on your computer. If the installer does not find an available version of Java on your computer, it will prompt you to install Java.

- If installing on a **Windows** server, right-click the executable and select **Run as administrator**. This is vital to ensure proper installation and to avoid permission issues later.
- If installing on **Linux**, you may install either as a root or non-root user. Linux services will be installed automatically when running as root, but services will not be installed when running as a non-root user. Have your Linux system administrator create services for GE PulseNET after the installation is completed.

**Installer command line options:**

Without any command line options the GE PulseNET installer will open the installation wizard as described beginning with Step 2 in the following sections.

GE PulseNET also supports a “silent” install option which will install GE PulseNET without prompts using all default values. Use the following syntax for a silent mode install.

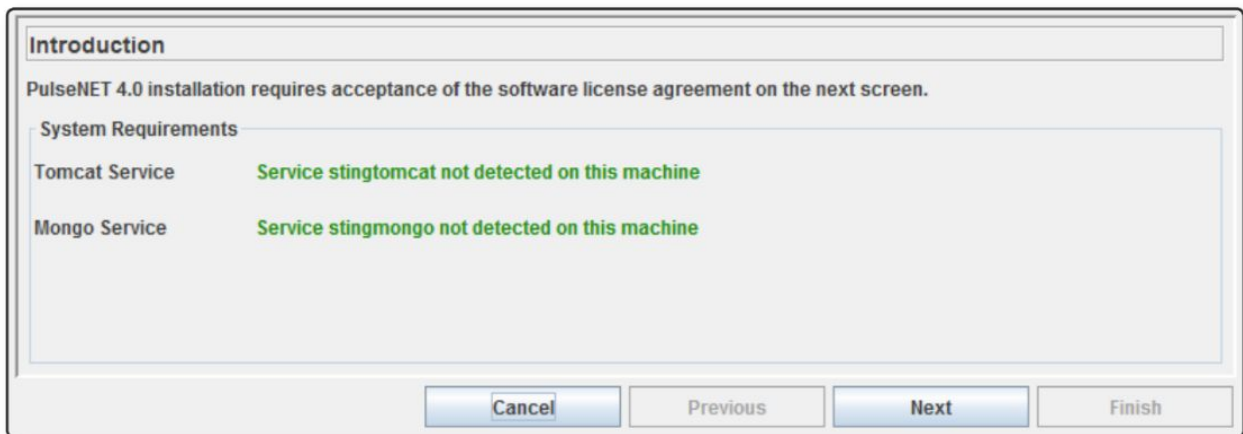
- **Windows:** `pulsenet-install-4.5.0.exe -s`
- **Linux:** `java -jar pulsenet-install-4.5.0.jar -s`

The silent mode install also supports an option that allows you to set the directory location for the installation. `-t C:\full\path\to\install\location`

To reinstall the GE PulseNET services without installing any other components, use the `-a` option. You may also include the `-t` option to specify the parent path of the existing GE\_MDS folder if it is different than the default. On Linux you also have the option for an interactive command line installation using the `-i` option.

**Step 2: Introduction**

- The Introduction screen shows whether the installation requirements have been met. Each installation screen includes a **Previous** button so you can go back to adjust the specified information as needed.
- Click **Next** after reading the contents of the Introduction screen.



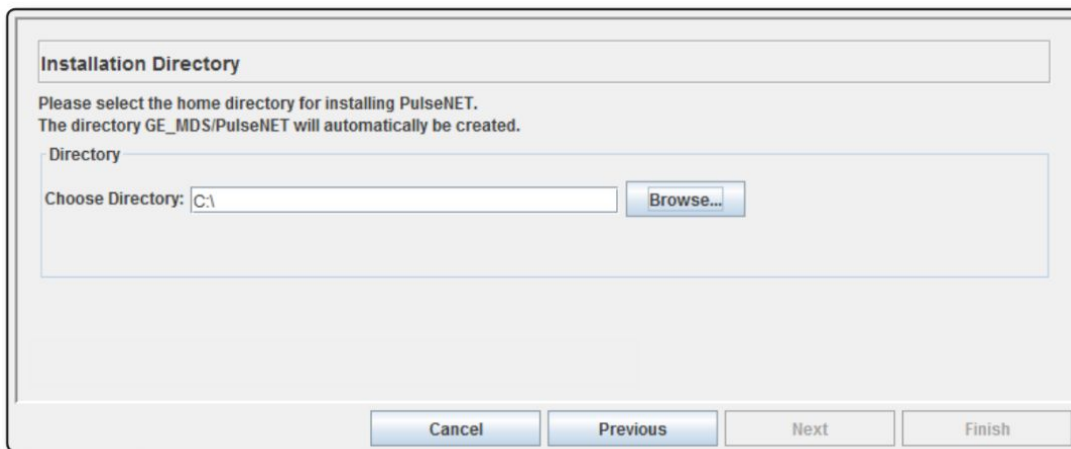


### Step 3: License Agreement

- Read the full GE PulseNET License Agreement and select **I Agree**. You may print the entire license agreement at this point, if you desire.
- Click **Next**.

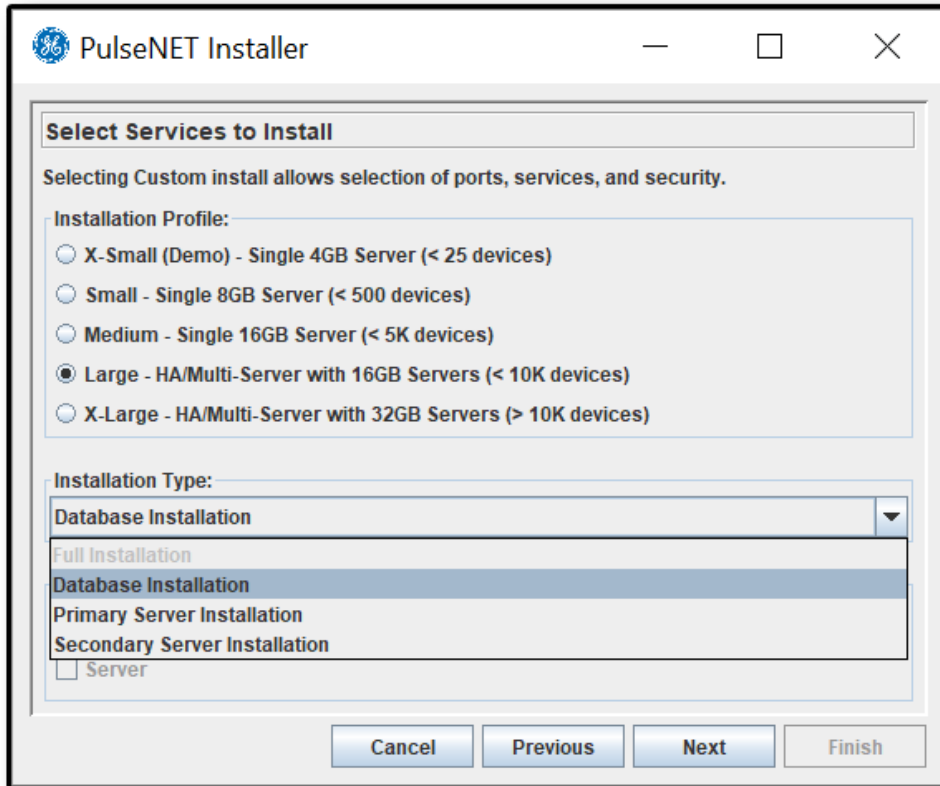
### Step 4: Installation Directory

- Select an existing directory or the default root directory for the installation of GE PulseNET which will be automatically appended with GE\_MDS\PulseNET. NOTE: Do not use spaces in the directory name.
- Click **Next**.



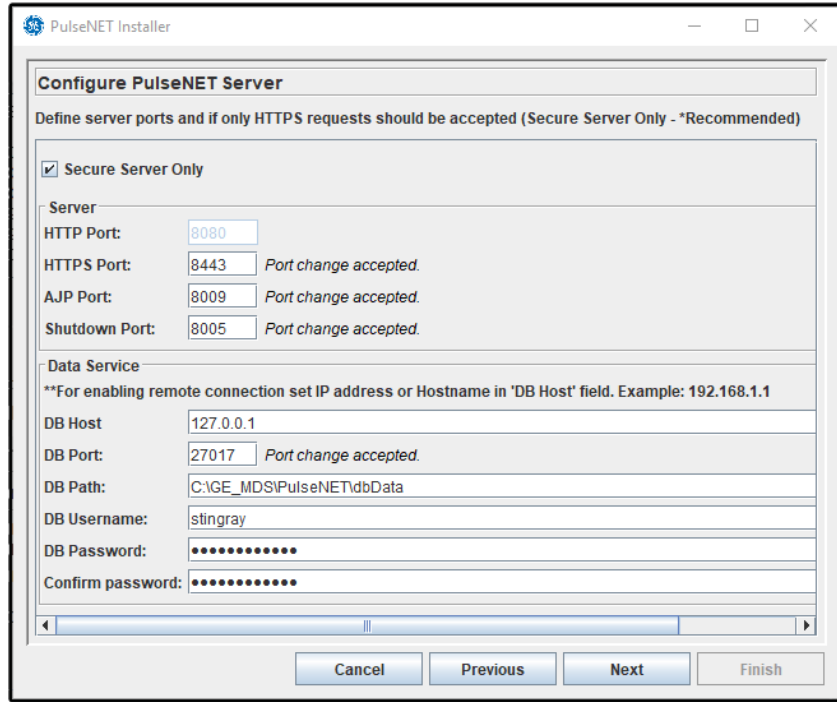
### Step 5: Select Services to Install

- The screen on the next page shows the GE PulseNET services that can be installed.
- Under **Installation Profile**, select the **Configuration Profile** that matches the number of devices you plan to monitor. Keep in mind your organization's plans for increased processing and future growth of device structures.
- The additional options under the **Installation Type** dropdown menu are used when customizing installation for more complex server configurations. A more complex server system is needed to support a larger number of devices (greater than 5K devices), including Load Balancing, High Availability Mode, and web-server fault tolerance (See **Installing GE PulseNET in Multi-Server or High Availability Modes** below for more details).
- Click **Next**.



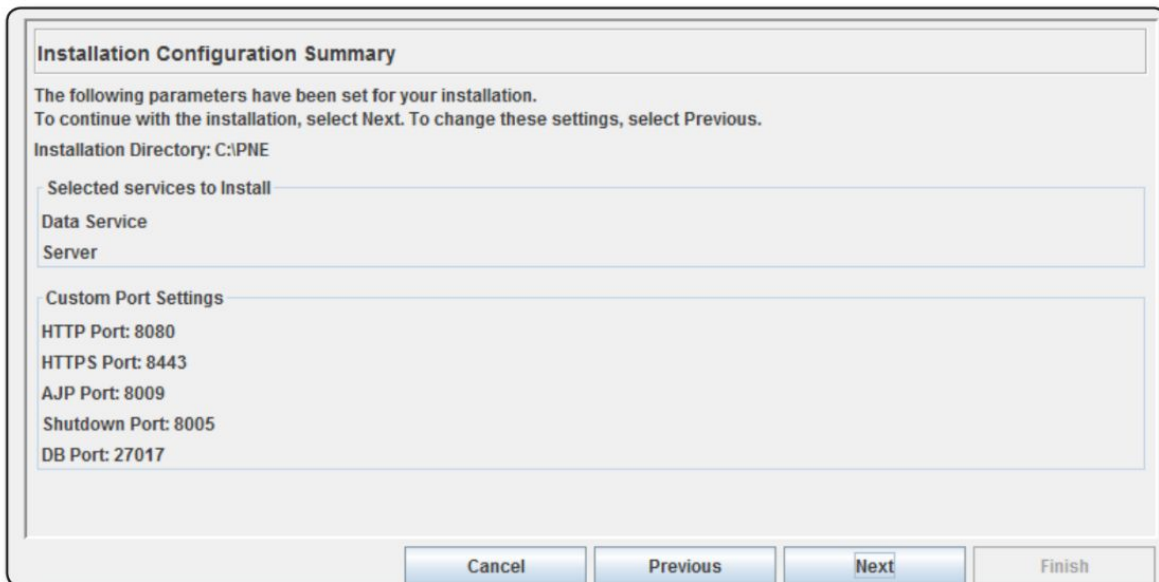
### Step 6: Configure GE PulseNET Services

- In the Configure PulseNET Server screen, you may change any of the default GE PulseNET ports if required. You may also select whether to run GE PulseNET's web service in insecure (HTTP) mode as well as HTTPS (SSL).
- You may also change the default settings for GE PulseNET's database since it may be hosted on a separate host.
- Click **Next**.



### Step 7: GE PulseNET Configuration Summary

- Review the installation configuration and use the **Previous** button to change any settings that are not correct.  
When you are satisfied that the settings are accurate, click **Next**.

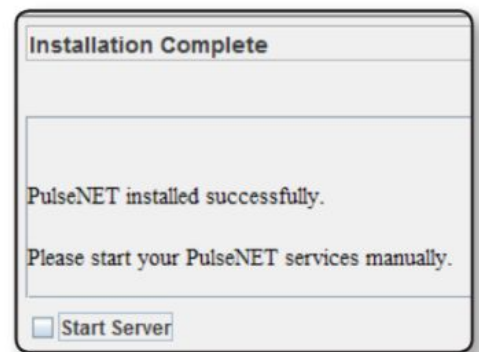


### Step 8: GE PulseNET Installation

- GE PulseNET installs the files into the selected directory. The default installation path is <directory\_you\_selected>\GE\_MDS\PulseNET.
- Once the progress bar reaches 100%, click **Next**.

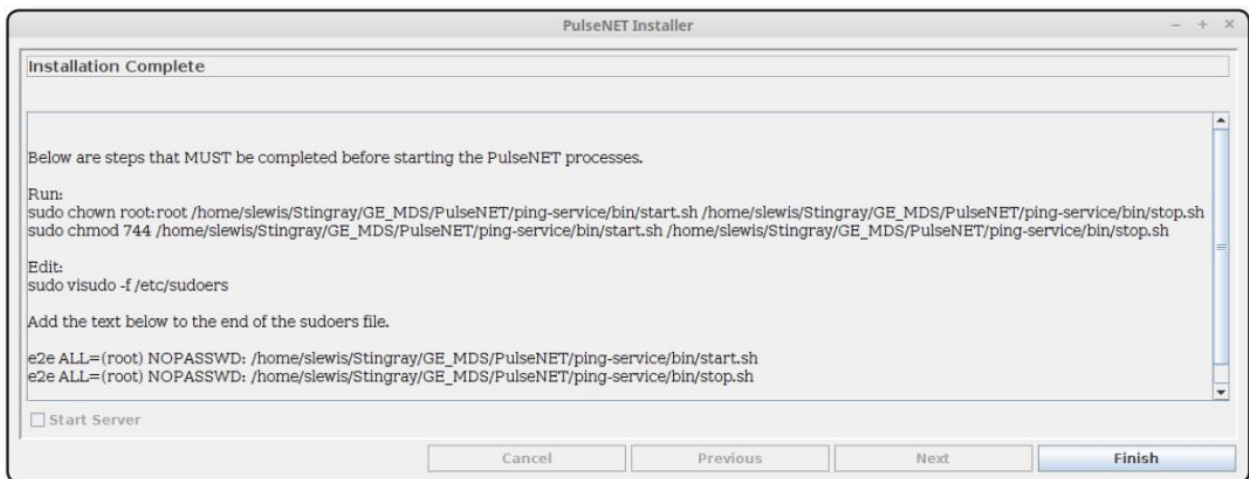
### Step 9: GE PulseNET Server Startup

- If you installed GE PulseNET using server Administrator or root credentials, you will have the choice to start the GE PulseNET services now by checking the **Start Server** checkbox and clicking **Finish**.
- If you installed on Linux using a non-root account, the **Start Server** checkbox will not be available and you must start GE PulseNET manually.



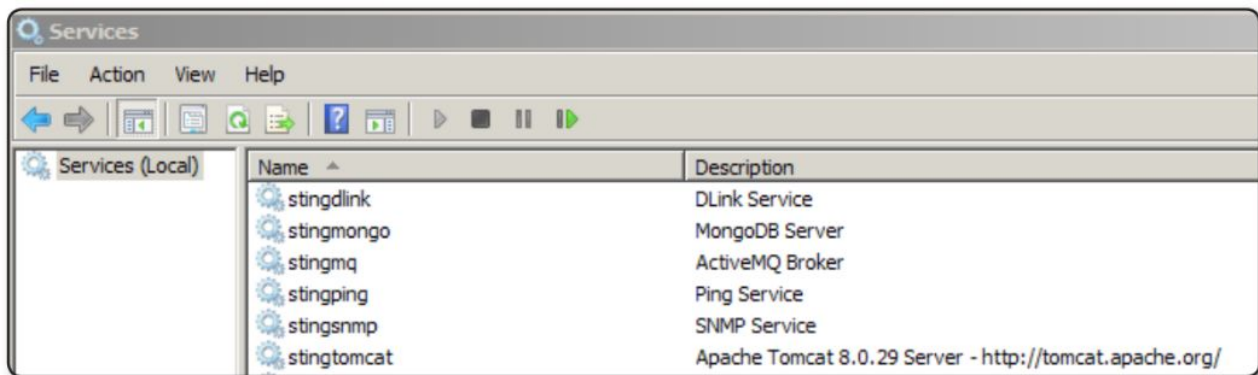
#### Additional steps for non-root user install on Linux:

If GE PulseNET was installed as a non-root user on Linux, then the ping service must be given escalated privileges in order to run correctly. The **Installation Complete** screen provides detailed instructions for changing the file attributes of the ping service and adding the non-root user to the sudoers file.



## Step 10: Startup Verification

You can verify that GE PulseNET is running by checking the processes started on your server. Six services will be running as shown below from the Windows Services console. A similar services application is available on Linux servers with graphical displays.



### Starting GE PulseNET Manually

- Navigate to the directory `<pulsenet_home>` and execute the `start.bat` or `start.sh` file that is applicable for your operating system.
- When GE PulseNET starts successfully, the following message appears in the command window: `PulseNET startup completed.`

### Stopping GE PulseNET Manually

- Navigate to the directory `<pulsenet_home>` and execute the `stop.bat` or `stop.sh` file that is applicable for your operating system.

### Importing a Network Security Certificate

GE PulseNET relies on the underlying Apache Tomcat web service to provide secure access. To install network security certificates, refer to the steps for configuring security on the [Apache Tomcat website](https://tomcat.apache.org/tomcat-8.0-doc/ssl-howto.html) (<https://tomcat.apache.org/tomcat-8.0-doc/ssl-howto.html>). Once the Apache Tomcat security certificates have been imported, GE PulseNET will need to know how to use them.

1. Locate the full path to your certificate file (JKS, PKCS11 or PKCS12 format).
2. Edit the GE PulseNET **server.xml** file in `<pulsenet-home>\apache-tomcat\conf`
3. Find the **keystoreFile** variable and set it to the full path of your certificate
4. Set the **keyAlias** to "tomcat"
5. Set the **keystoreType** to your keystore type (ex. "JKS", "PKCS11" or "PKCS12")
6. Set the **keyStorePass** to the password for your keystore file
7. Save the **server.xml** file and restart the **stingapache** service.

## Uninstalling GE PulseNET

There are steps that must be executed after the uninstaller completes in order to completely remove GE PulseNET from the machine. The simple process listed below can be used to uninstall GE PulseNET manually.

- Open a command window or file explorer and navigate to the `<pulsenet-home>` directory and run the `uninstall.bat` or `uninstall.sh` program that is appropriate for your operating system.
- To delete any remaining program files, navigate to the GE\_MDS install location and recursively remove all of the remaining files and folders.

# Upgrading GE PulseNET

## Preparing to Upgrade

Before upgrading GE PulseNET, complete the following steps:

1. Review the list of installation considerations given in [Planning Your Installation](#).
2. Ensure that your GE PulseNET machine has enough disk space to store both the old and new versions of GE PulseNET, as well as any backup files you will create.
3. Stop GE PulseNET and generate a backup of the previous version by copying the **GE\_MDS\PulseNET** directory to something like **GE\_MDS\PulseNET-<timestamp>**, or use an archiving tool to package your previous directory tree into a compressed archive file (ex. zip).

## Migrating from GE PulseNET 3.x to 4.x

If you will be upgrading from GE PulseNET version 3.x to the new 4.x release, please contact the GE MDS Support Center for assistance with the upgrade. Be aware that the licensing feature in GE PulseNET requires that you obtain a new license key from GE MDS Support after the 4.x installation has completed.

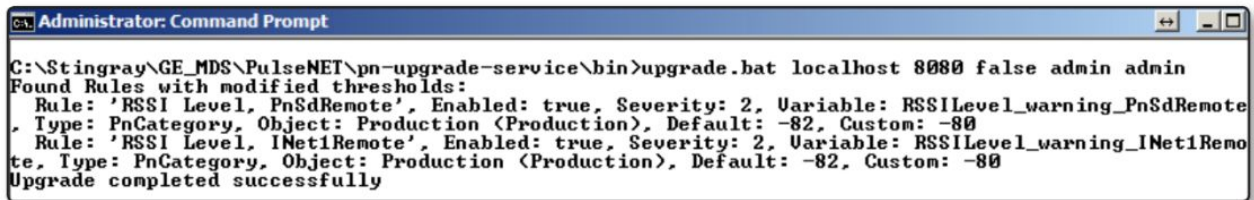
The upgrade process requires that the previous and new versions of GE PulseNET be running simultaneously so that existing information can be exported from the previous version and imported into the new version. This means that GE PulseNET directory and port settings may need to be configured to allow both versions to run (especially on the same machine), and after the upgrade these directory and port settings can be reset.

The new agents and the old agents cannot be polling devices at the same time. Before the new agents can pull data from the new devices, the old agents need to be shut down. To shut down the old agents, run the following command `fglam -r` from an Administrative Command Window in the legacy 3.x directory `GE_MDS\PulseNET\bin`. The same command can be used for Windows and Linux platforms.

### Example:

```
C:\GE_MDS\PulseNET\fglam\bin\fglam -r
```

The data export/import is accomplished by the GE PulseNET 4.x Upgrade Service, which must be executed from an Administrator command prompt as shown below.



```
Administrator: Command Prompt
C:\Stingray\GE_MDS\PulseNET\pn-upgrade-service\bin>upgrade.bat localhost 8080 false admin admin
Found Rules with modified thresholds:
  Rule: 'RSSI Level, PnSdRemote', Enabled: true, Severity: 2, Variable: RSSILevel_warning_PnSdRemote
, Type: PnCategory, Object: Production (Production), Default: -82, Custom: -80
  Rule: 'RSSI Level, INet1Remote', Enabled: true, Severity: 2, Variable: RSSILevel_warning_INet1Remo
te, Type: PnCategory, Object: Production (Production), Default: -82, Custom: -80
Upgrade completed successfully
```

The upgrade service requires the following command line parameters:

The hostname or IP address of the existing GE PulseNET 3.x server, the GE PulseNET 3.x web server port number (8080 or 8443), whether the GE PulseNET 3.x web server is using HTTPS/SSL encryption (true or false), and the username/password for the administrative user.

If the upgrade service reports any error messages, the GE MDS Support team can troubleshoot them using the GE PulseNET 4.x log files.

## Upgrading from GE PulseNET 4.1, 4.2, 4.3, or 4.4

Customers with an existing GE MDS PulseNET 4.1.0, 4.2.0, 4.3.0, or 4.4.0 environment should obtain the GE MDS PulseNET 4.5.0 upgrade file, which is delivered as a ZIP or TAR archive containing new software and logic. To upgrade an existing GE MDS PulseNET 4.x environment, extract the files from the archive and follow the steps below.

You will need to know the path to your GE MDS PulseNET home directory as well as the path to the GE MDS PulseNET upgrade package. It is best to use full path specifications rather than relative paths in order to avoid potential issues during the upgrade.

## Upgrade Instructions

1. On Windows, open a command window as the Administrator user. On Linux, open a terminal window using the account that you used when you installed GE MDS PulseNET.
2. Navigate to the directory into which you extracted the contents of the upgrade archive, and then navigate to the bin directory. In the example below, the path was

```
C:\Downloads\pulsenet-4.5.0-update-installer\bin
```

3. Execute `install.bat` or `install.sh` after entering the full path to your GE MDS PulseNET home directory as well as the path to your GE MDS PulseNET 4.5.0 upgrade package as command line arguments.



```
> install.bat C:\GE_MDS\PulseNET ↓
C:\Downloads\pulsenet-4.5.0-update-installer\pulsenet-4.5.0-update.pn
```

4. The command line installer should start, validate the required licenses, import any json files, stop the existing GE MDS PulseNET services, install the new code, restart GE MDS PulseNET services, and provide you with feedback on the success of the upgrade (as shown on the next page).

If you experience any issues, contact **GE MDS PulseNET Support** for assistance.

```
Starting Command-line Installer
Validating required license: PulseNET
Importing json files
Stopping server
.....
Installing files
Starting server
Installation completed successfully
Press any key to continue . . .
```

5. Log into the GE MDS PulseNET web interface and check the **About** box to verify the new version number.

## Upgrading a Multi-Server/HA System

Customers with an existing GE MDS PulseNET 4.4.0 Multi-Server/High Availability environment should obtain the GE MDS PulseNET 4.5.0 upgrade file, which is delivered as a ZIP or TAR archive containing new software and logic. To upgrade an existing GE MDS PulseNET 4.x environment, extract the files from the archive and follow the steps below. **NOTE:** If you are currently running a single standalone server and wish to convert to a HA/Multi-Server environment, contact GE support.

You will need to know the path to your GE MDS PulseNET home directory as well as the path to the GE MDS PulseNET upgrade package. It is best to use full path specifications rather than relative paths in order to avoid potential issues during the upgrade.

Before you upgrade the primary or secondary servers, you must upgrade the database server. Once the database server is upgraded, you can proceed to upgrade the primary and then secondary servers.

### Upgrade Instructions

1. In Windows, open a command window as the Administrator user. On Linux, open a terminal window using the account that you used when you installed GE MDS PulseNET.
2. Shutdown the primary and secondary servers by navigating to the directory <pulsenet\_home> and executing the stop.bat or stop.sh file that is applicable for your operating system.
3. Navigate to the directory into which you extracted the contents of the upgrade archive, and then navigate to the bin directory. In the example below, the path was

```
C:\Downloads\pulsenet-4.5.0-update-installer\bin
```

4. Execute `install.bat` or `install.sh` after entering the full path to your GE MDS PulseNET home directory as well as the path to your GE MDS PulseNET 4.5.0 upgrade package as command line arguments.

```
> install.bat C:\GE_MDS\PulseNET ↓
C:\Downloads\pulsenet-4.5.0-update-installer\pulsenet-4.5.0-update.pn
```

5. The command line installer should start, validate the required licenses, import any json files, stop the existing GE MDS PulseNET services, install the new code, restart GE MDS PulseNET services, and provide you with feedback on the success of the upgrade (as shown on the next page).

```
Starting Command-line Installer
Validating required licenses: [PulseNET, PulseNET Enterprise]
Importing json files
Stopping server
.....
Installing files
Starting server
Installation completed successfully
Press any key to continue . . .
```

6. Log into the GE MDS PulseNET web interface and check the **About** box to verify the new version number.
7. Repeat Steps 1-6 for upgrading the primary and secondary servers. See **Starting GE MDS PulseNET Manually** for instructions on restarting the primary and secondary servers. If you experience any issues, contact **GE MDS PulseNET Support** for assistance.

**About GE MDS**

Over two decades ago GE MDS began building radios for business-critical applications. Since then we have installed millions of radios in countries across the globe. We overcame impassable terrain, brutal operating conditions, and complex network configurations to succeed. We also became experts in wireless communication standards and applications worldwide. The result of our efforts is that today thousands of organizations around the world rely on GE MDS wireless networks to manage their critical assets.

The majority of GE MDS radios deployed since 1985 are still installed and performing within our customers' wireless networks. That's because we design and manufacture our products in-house, according to ISO 9001, which allows us to meet stringent global quality standards.

Thanks to our durable products and comprehensive solutions, GE MDS is the wireless leader in industrial automation—including oil and gas production and transportation, water/wastewater treatment, supply, and transportation, electric transmission and distribution, and many other applications. GE MDS is also at the forefront of wireless communications for private and public infrastructure and online transaction processing. As your wireless needs change, you can continue to expect more from GE MDS. We'll always put the performance of your network above all.

**GE MDS ISO 9001 Registration**

GE MDS adheres to the internationally-accepted ISO 9001 quality system standard.

**To GE Customers**

We appreciate your patronage. You are our business. We promise to serve and anticipate your needs. We will strive to give you solutions that are cost effective, innovative, reliable and of the highest quality possible. We promise to engage in a relationship that is forthright and ethical, one that builds confidence and trust. Data sheets, frequently asked questions, application notes, firmware upgrades and other updated information is available on the GE MDS Web site.

**Manual Revision and Accuracy**

This manual was prepared to cover a specific version of our product. Accordingly, some screens and features may differ from the actual version you are using. While every reasonable effort has been made to ensure the accuracy of this guide, product improvements may also result in minor differences between the manual and the product shipped to you. If you have additional questions or need an exact specification for a product, please contact our Customer Service Team using the information below. In addition, manual updates can often be found on the GE MDS Web site.

**About End 2 End Technologies**

End 2 End (E2E) Technologies offers a unique combination of wireless communications and information technology expertise. We improve efficiency, reduce risk and lower the cost of industrial field operations via modernization and management of our customer's wireless communications networks. From initial planning through lifecycle support we assist your team in adopting a wireless solution that keeps communication costs low while maximizing network reliability and performance. For more information visit us at [www.e2etechinc.com](http://www.e2etechinc.com).

**Customer Support**

If you have problems, comments, or questions pertaining to the GE MDS PulseNET application, please contact GE MDS via one of the methods below.

**Phone** 585-241-5510

**Email** [gemds.techsupport@ge.com](mailto:gemds.techsupport@ge.com)

**Fax** 585-242-8369

**License Credits**

GE MDS PulseNET contains several third party components. Please refer to the complete list of these components at [www.e2etechinc.com/index.php/about/legal](http://www.e2etechinc.com/index.php/about/legal).