GE
Grid Solutions

Perception Web

Transformer Monitoring Software
Version 2.4

Installation & User Guide

GE Building a world that works

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Related Documents

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MA-020	Perception Desktop - Installation & User Guide
MA-021	Perception Server - Installation & User Guide
MA-023	Perception Workflow Designer - Installation & User Guide

Abbreviations & Definitions

Abbreviation	Meaning
KPD	file suffix for a Perception Database file (stored in a SQL format)
TOA	file suffix for a device configuration file (stored in a CSV format)
DGA	Dissolved Gas Analysis
CSV	Comma Separated Variable – an industry-standard neutral data exchange format
SQL	Structured Query Language – an industry-standard database format

1 INTRODUCTION

1.1 Product Overview

Perception is a software product designed to assist power plant personnel in the maintenance and management of oil-insulated equipment used in the transmission and distribution of electrical power. It is used primarily for diagnosing fault conditions as well as trending measurements taken from transformers, circuit breakers and tap-changers.

The software accepts data from either manual or automated programs of regular sampling and condition analysis of the equipment's insulating oil as well as other performance data. Several well-established and recognized empirical diagnostic rules are used to present information to the user on the condition of the insulating oil used in the electrical equipment. This assists in the running of a maintenance program and in the identification of potential fault conditions. It allows both the maintenance engineer and asset manager to monitor and diagnose transformer data collected by GE's range of on-line monitoring units. The data includes Dissolved Gas Analysis (DGA), calculated models, bushing and other transformer measurements. By providing access to this valuable data along with powerful diagnostic tools, Perception delivers clear transformer condition information. This enables decisions to be made quickly and reliably, helping to extend the life of transformers, reduce unplanned outage, and avoid catastrophic failure.

Although Perception is an expert analysis and information system, it is only an aid and should not be regarded as a replacement for the knowledge of a subject matter expert in the analysis of insulating oil used in electrical equipment and the operation of oil filled power equipment.

1.2 Software Family

There are four members of the Perception family.

- Perception Desktop — A standalone software application that provides customized access to the centrally located asset database. It provides advanced diagnostic profiles on device data, a multi-page transformer report containing key transformer information as well as the facility to launch external applications. Additionally, Perception Desktop can operate standalone or as part of a larger centralized asset management suite in conjunction with Perception Server.

- Perception Server — The pinnacle of transformer asset management software. Perception Server provides a fleet-wide network overview via a wallboard display, automatic data downloading with configurable scheduling, email notifications of device condition changes and a TOA4 data export facility. It uses a centralized data storage location based on SQL Server to which Perception Desktop links seamlessly via secure OPC UA communications.

- Perception Web — A web-based solution that provides *read-only* access to the centrally located asset database. This offers a convenient way to obtain readings and consolidated data analysis across a variety of platforms including mobile devices. This includes transformer dashboards, wallboards and an overview to the status of the entire transformer fleet.

- Perception Workflow Designer — The workflow designer uses common flowcharting techniques to express transformer diagnostic processes as a model. These models

are known as workflows and in turn drive the Perception dashboard. The Designer brings easily modifiable workflow-enabled capabilities to the Perception software suite allowing control over the diagnostic process and customization of how data is presented on the Perception dashboard.

1.3   What's New?

- DGA 900 Plus with Bushing Monitoring
- DGA 900 Rate Of Change worksheet
- DGA 900 Plus with Models OLTC Tap Position
- Support for 8 series relays (845, 850, & 869). New installer, ranking workflows and diagnostic tools including COMTRADE download
- DGA 900 MultiTank products, MultiTrans and TapTrans
- New Motor asset and corresponding Dashboard
- Minor enhancements and bug fixes

Note: If upgrading to Perception Desktop/Server 2.4. X from version 1.X, please contact GE Support before commencing as depending upon the size and complexity of the existing database, a service visit may be required to make the transition.

1.4 System Requirements

The minimum PC and system requirements for Perception Web:

Operating System: Windows 7 with .NET Framework 4.5
CPU: 1 GHz Processor
Memory: 1 GB RAM
HDD: 500 MB free
Graphics Card: 64 MB graphics, update to the latest driver for your hardware to ensure that it can provide all the facilities of .NET Framework 4.5

Perception Web supports the following web browsers:

Platform	Browser	Supported Versions
Windows	Internet Explorer	9 and above
	Firefox	28
	Chrome	21+
OS X	Safari	5.1+
iOS	Safari	iOS 5+
Android	Browser	4+
Blackberry	Browser	10+

1.5 Customer Support

E-mail: GA.support@ge.com

United Kingdom   +44 1785-250-070

North America toll-free: 1-800-361-3652

Worldwide: +1 514-420-7460

2 INSTALLING AND CONFIGURING PERCEPTION WEB

2.1 Overview

To publish content for access over the Internet or intranet, you need to host the content via a web site on your web server. Microsoft's Internet Information Services (IIS) is the primary tool for such hosting services and comes included with Windows. By default, an IIS web site is created in the *\inetpub\wwwroot* directory on your web server. You can either choose to use this default directory to publish your web content, or you can create a directory at a location of your choice.

There are several steps to installing and setting up Perception Web:

- Enable Internet Information Services (IIS)
- Create the Application Pool
- Run the Perception Web installer
- Configure the Certificates

See Appendix A for installing and configuring Perception Web on Windows Server 2008.

Note: A Perception Web login requires Perception Server to be installed and configured, including the creation of a user account. For more information, refer to the Perception Server manual.

2.2 Enable Internet Information Services (IIS)

In Windows, Internet Information Services (IIS) is turned off by default. The first step is therefore to enable IIS through the Microsoft Management Console or Administrative Tools in the Control Panel.

To enable features in Windows, go to Windows Control Panel and double click **Programs and Features**. Then click the **Turn Windows features on or off** link as shown in Figure 2-1.
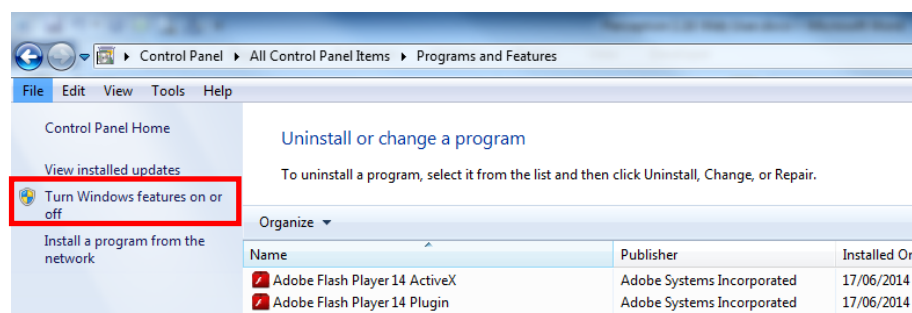

Figure 2-1: Programs and Features

Under **Internet Information Services** ensure that the following features are enabled as shown in Figure 2-2.
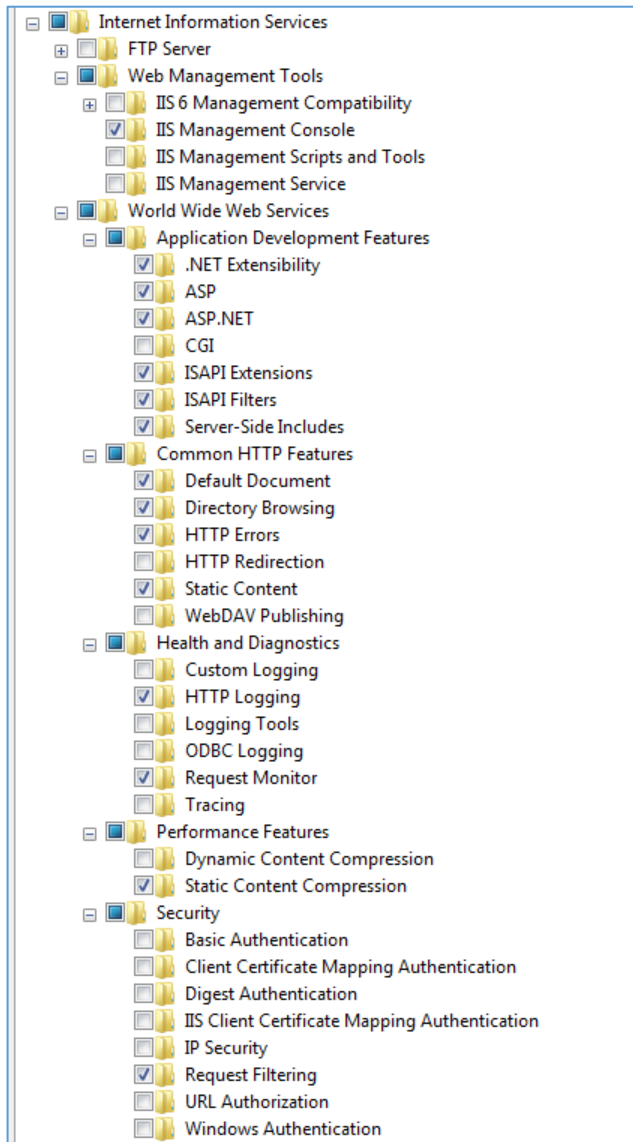

Figure 2-2: Windows Features

Click **OK** to confirm the new settings. Windows may take several minutes as shown in Figure 2-3 to initiate the system changes.
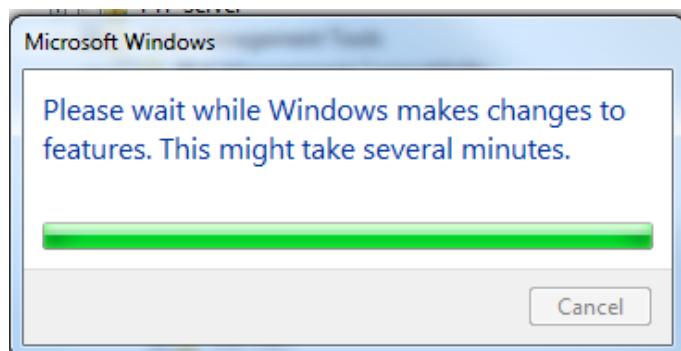

Figure 2-3: Update system

2.3   Create the Application Pool

Web applications and sites are typically grouped into application pools on a web server. This effectively creates a process boundary that serves to isolate applications and provide a more stable environment. Perception Web supports an application pool running under the local system account with .NET Framework 4.0 or higher, Integrated managed pipeline and 32-bit support. If a suitable pool for Perception does not already exist on the web server, it is necessary to create one using the following steps:

Open **IIS Manager**, select **Application Pools** and right-click to select **Add Application Pool** as shown in Figure 2-4.
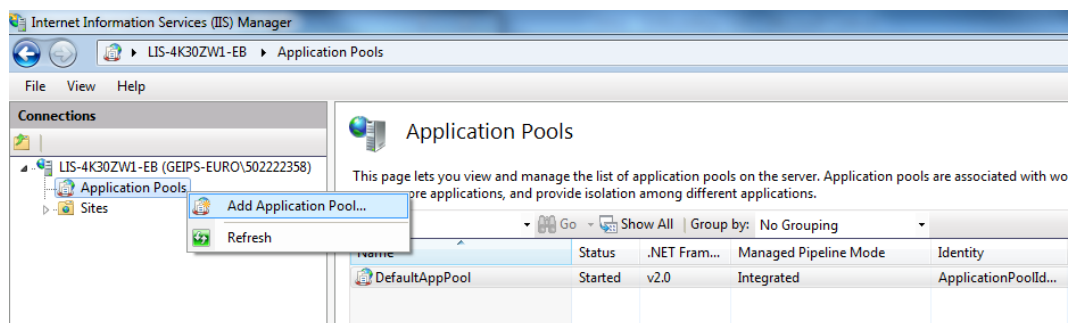

Figure 2-4: Add an Application Pool

In the 'Add Application Pool' dialog box, enter an appropriate name for the pool, for example, **ASP.NET 4.0 App Pool**, then select an appropriate version of the .NET Framework, for example, **.NET Framework v4.030319**.

Note: If the correct .NET Framework is installed, but not listed here, refer to Section 2.6.1.

Under 'Managed pipeline mode', select **Integrated**, select the **Start application pool immediately** checkbox and click **OK** as shown in Figure 2-5.
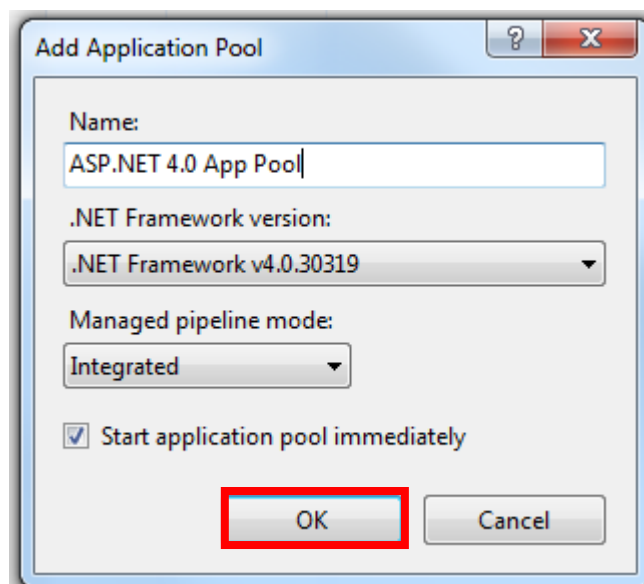

Figure 2-5: Name an Application Pool

The available Application Pools on the web server are listed to the right in Figure 2-6. Notice the recently created application pool called 'ASP.NET 4.0 App Pool'.

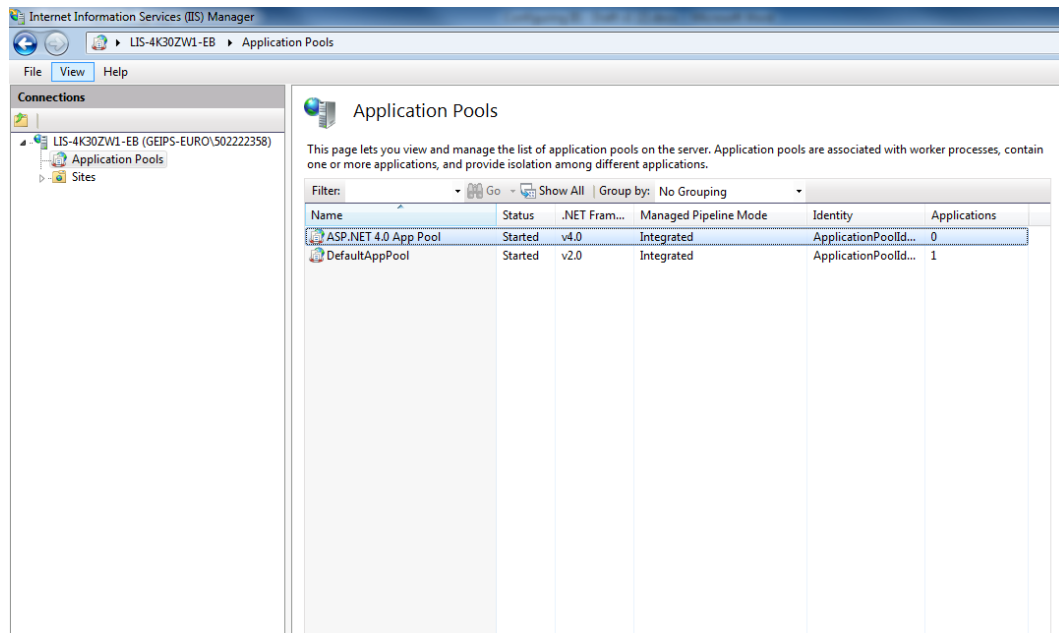Note: During the client installation, you'll be able to associate Perception Web with this application pool.

Figure 2-6: List of Application Pools

[*64-bit machines only*] If your machine is 64-bit, it's important to ensure that 32-bit applications are supported. To do this, right-click on the newly created application pool, for example, **ASP.NET 4.0 App Pool**, and select **Advanced Settings** as shown in Figure 2-7.
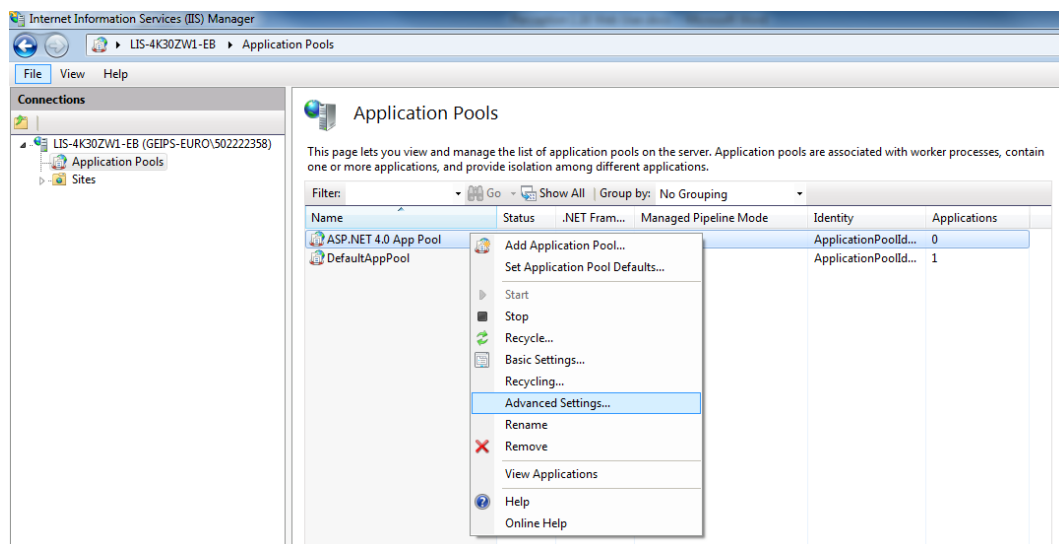

Figure 2-7: Configure Application Pool Settings

In the 'Advanced Settings' dialog, under the 'General' category, click the **Enable 32-Bit Applications** field and select **True**.

And under the 'Process Model' category, click the **Identity** field, select **LocalSystem** and click **OK** as shown in Figure 2-8.

Note: LocalSystem ensures that the application has the same privileges as the current Windows user.
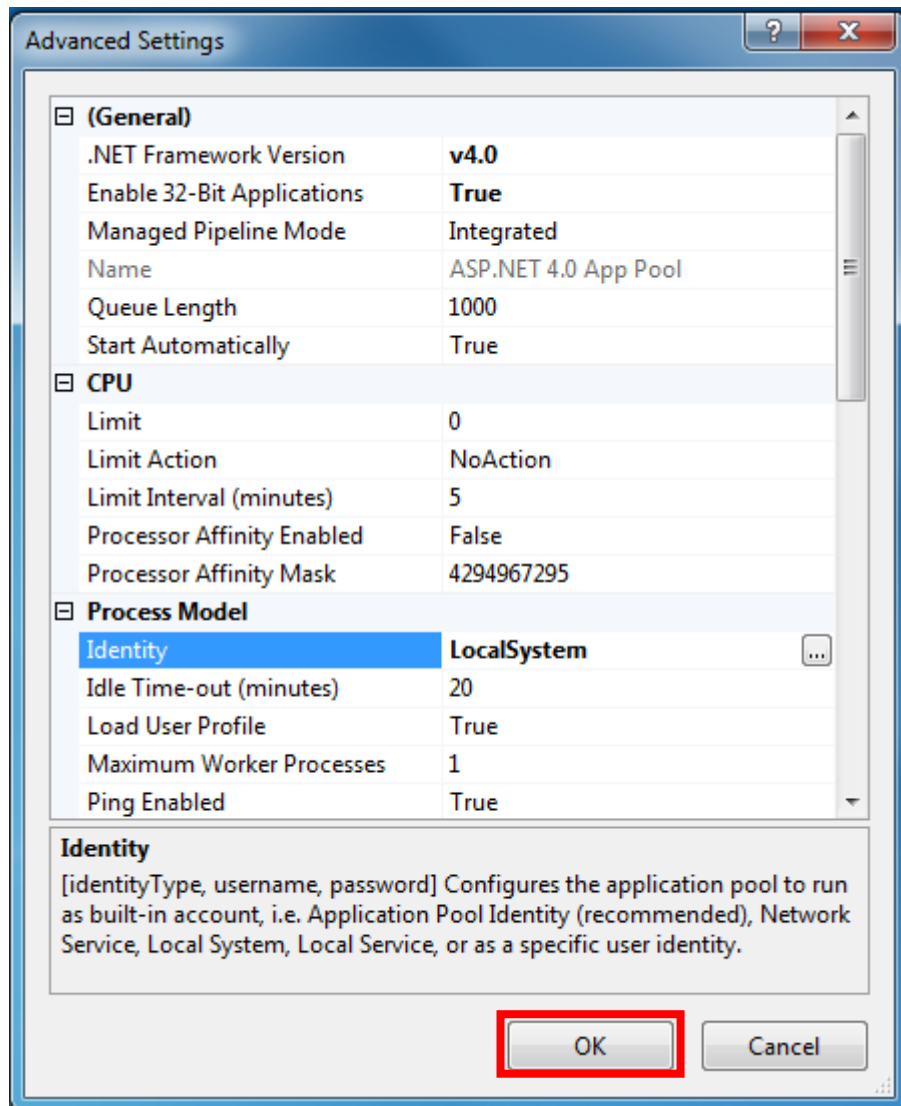

Figure 2-8: Advanced Settings

Finally close IIS — you are now ready to run the Perception Web installer.

2.4   Run the Perception Web installer

To install Perception Web, insert the Perception Desktop CD into your PC's CD drive and double click the *'Perception.Web.Setup.exe'* file. The Setup Wizard launches, and you click **Next** to continue as shown in Figure 2-9.

Note: The Installation CD contains other setup programs, so ensure you select the correct installer.
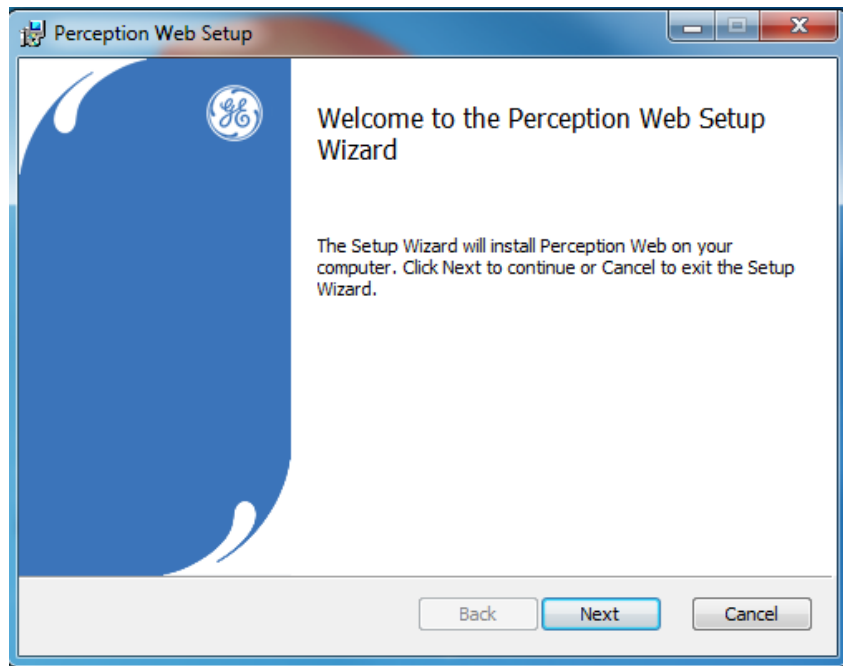

Figure 2-9: Welcome to the Perception Desktop Setup Wizard

If the License Agreement is acceptable, select **I accept the terms in the License Agreement** and click **Next** as shown in Figure 2-10.
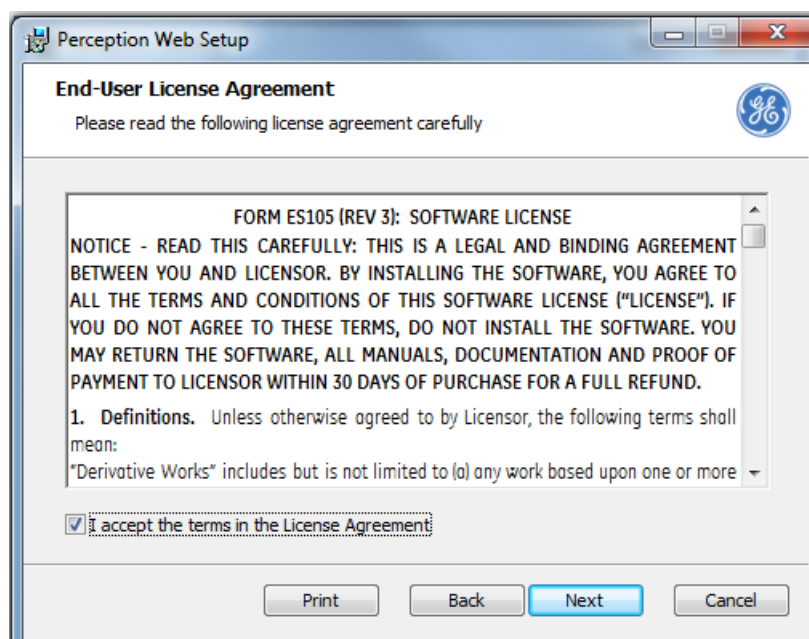

Figure 2-10: End-User License Agreement

Perception Web is hosted by IIS in a dedicated application pool. Select the web site that you wish to install Perception web — this could be the **Default Web Site** as shown in Figure 2-11 or any custom web site that you have defined previously.

The next step is to assign a suitable application pool to Perception Web. This could be the default application pool of the selected web site or a custom application pool that meets Perception Web minimum requirements.

For example, select **Use a Custom Application Pool instead of the selected website default** and select **ASP.NET v4.0 App Pool** as shown in Figure 2-11.
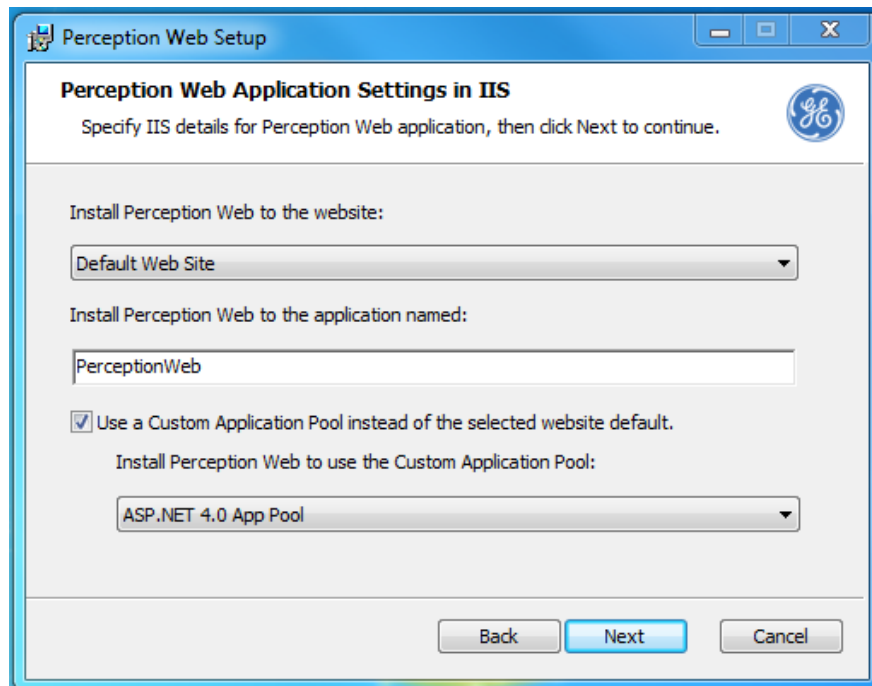

Figure 2-11: IIS settings

If known, specify the hostname or IP address of the Perception Server. Otherwise leave blank and click **Next** as shown in Figure 2-12.

Note: You can supply this information later via the web.config file (see Section 2.6.2).
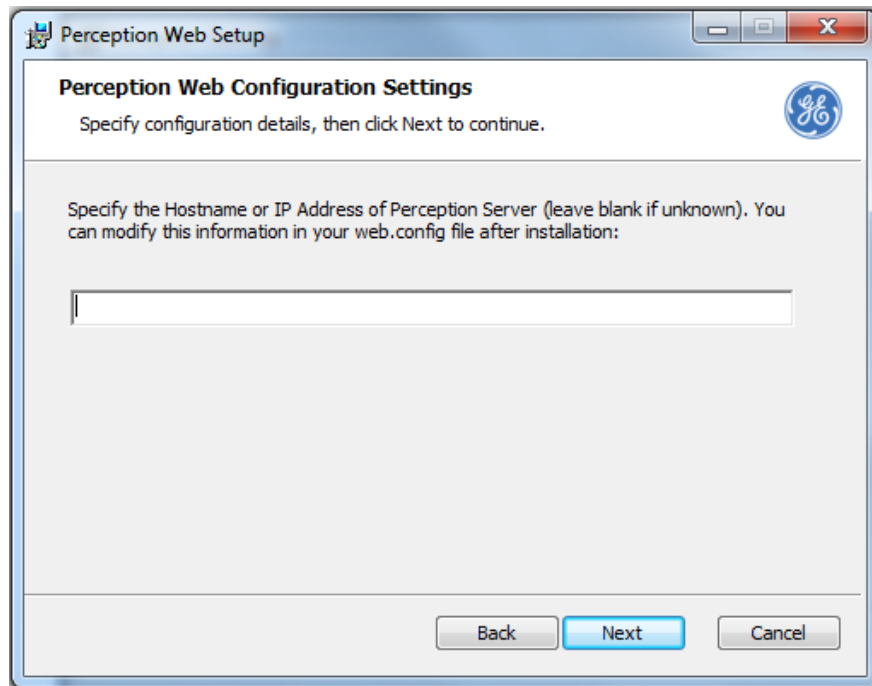

Figure 2-12: IP address of Perception Server

Specify a destination web folder for the installation (or accept the default) and click **Next** as shown in Figure 2-13.
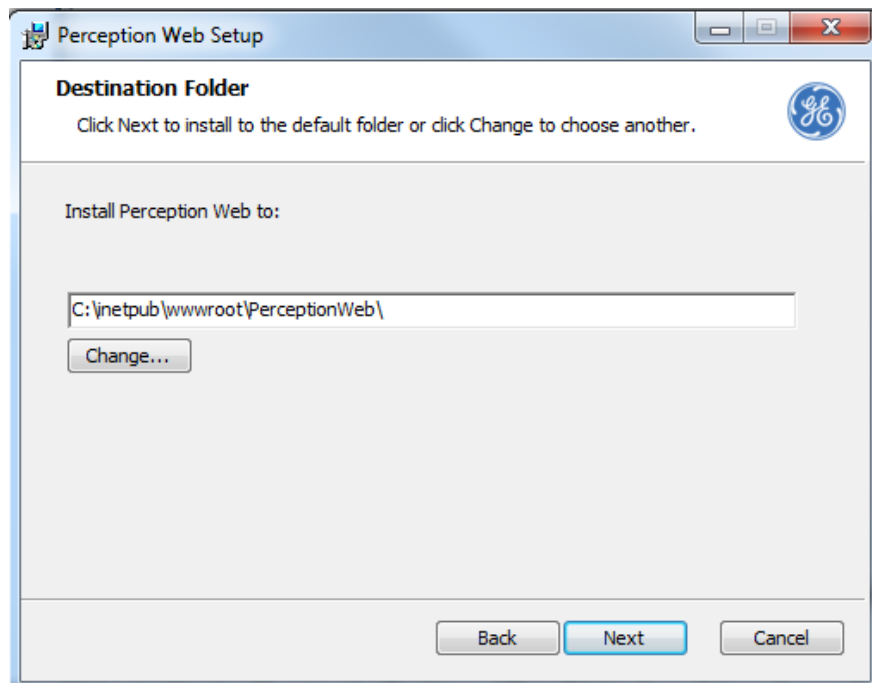

Figure 2-13: Destination Folder

Click **Install** to start the installation as shown in Figure 2-14. The installation may take several minutes. A progress bar indicates the progress so far.
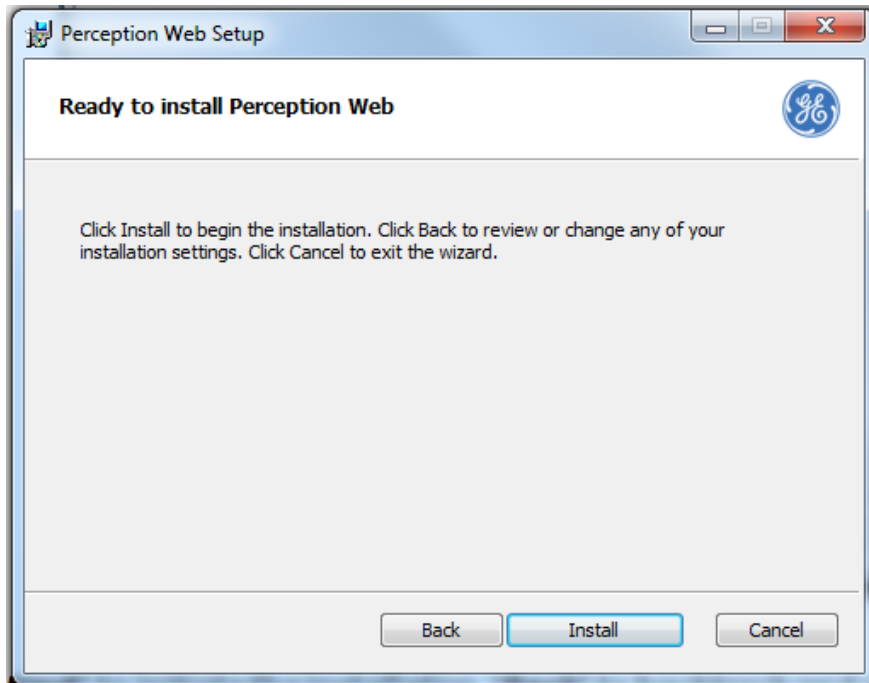

Figure 2-14: Ready to Install

The Setup Wizard proceeds with the installation and presents the following message on successful completion as shown in Figure 2-15. Click **Finish** to exit.
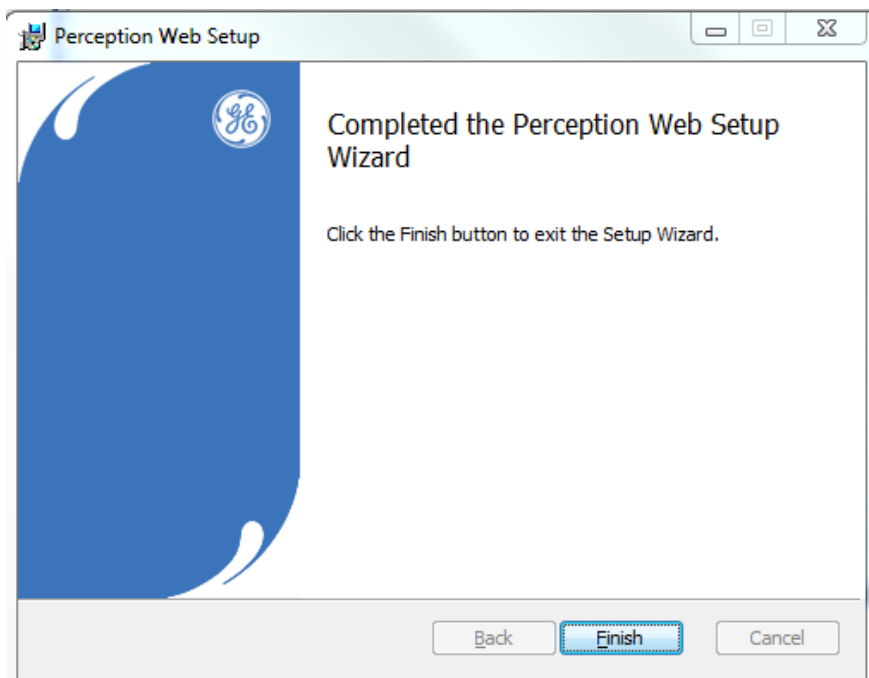

Figure 2-15: Completed

Perception Web is now successfully installed.

2.5 Configure the Certificates

As a security measure, Perception uses electronic credentials known as certificates to authenticate clients and servers. Every time a new client user is added, both the user and the server administrator must trust each other's certificates (or physically exchange certificates as outlined below). This ensures that the requisite trust exists between client and server. Once the certificates have been exchanged, seamless communication can take place.

2.5.1 Creating the Perception Certificates

A Perception Web client certificate is automatically created on the first instance of launching the web application and can be found in the subdirectory (*TrustedCertificates\certs*) of the Perception Web install location. A Perception Server certificate is automatically created as part of the Perception Server install and can be found in the directory (*C:\ProgramData\GE_Energy\Perception\TrustedCertificates\certs*) of the Perception Server machine. If the Perception certificates are missing or invalid, refer to Section 2.6.3.

2.5.2 Trusting the Perception Server Certificate

If the Server certificate is not trusted, the following error message displays as shown in Figure 2-16.
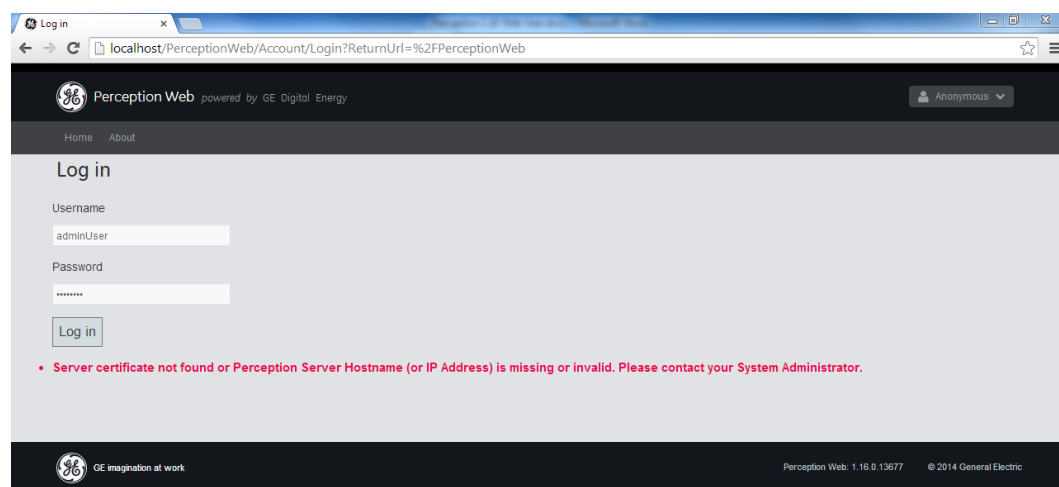

Figure 2-16: Invalid Server Certificate

To trust the server certificate, the certificate must be copied from the trusted certificates folder on the Perception Server machine to the trusted certificates folder on the client machine. To do this:

Open file manager on the Perception Server machine and navigate to the trusted certificates folder at this location:

`C:\ProgramData\GE_Energy\Perception\TrustedCertificates\certs`

Look for a certificate of the following format:

Perception.Server.<*computer name*>[key].der

Where *<computer name>* is the computer name of the server, and [*key*] is the public certificate key.

Copy this certificate to the *TrustedCertificates\certs* folder on the Perception Web install machine at this location:

<PerceptionWebInstallLocation>\TrustedCertificates\certs

Where *<PerceptionWebInstallLocation>* is the directory path specified in Figure 2-13, for example, *C:\inetpub\wwwroot\PerceptionWeb*.

2.5.3   Trusting the Perception Web client Certificate

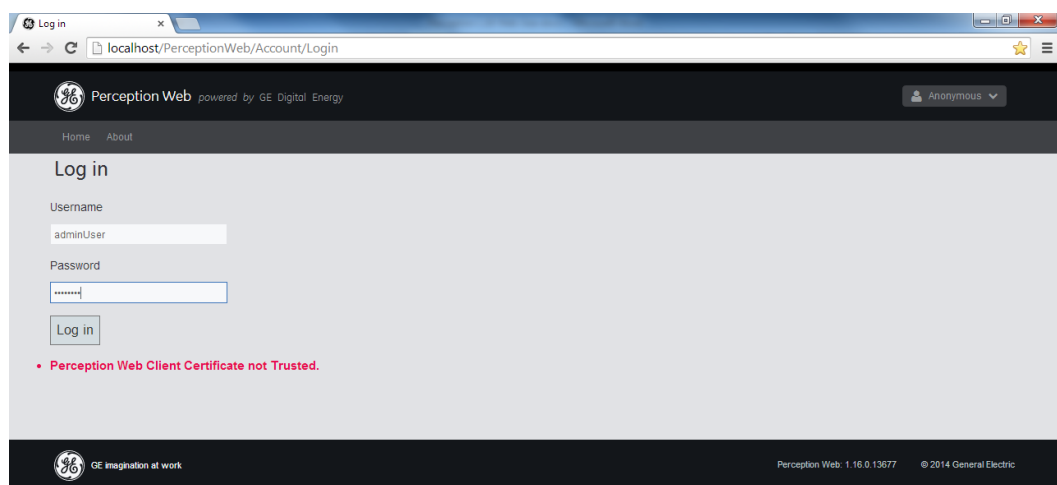If the Client certificate is not trusted, the following error message displays as shown in Figure 2-17.

Figure 2-17: Invalid Client Certificate

To trust the Perception Web client certificate, the certificate must be copied from the trusted certificates folder of the Perception Web client machine (or the rejected certificates folder on the Perception Server machine*[1]) to the trusted certificates folder on the Perception Server machine.

Open File Manager on the Perception Web client machine and navigate to the trusted certificates folder at this location:

<PerceptionWebInstallLocation>`\TrustedCertificates\certs`

Where *<PerceptionWebInstallLocation>* is the directory path specified in Figure 2-13, for example, `C:\inetpub\wwwroot\PerceptionWeb`.

Or alternatively, if an attempted connection was made*[1], the administrator can navigate to the rejected certificates folder on the Perception Server machine at this location: `C:\ProgramData\GE_Energy\Perception\RejectedCertificates\certs`

Look for a certificate of the following format:

`Perception.Web.<computer name>[key].der`

Where *<computer name>* is the computer name of the Perception web server, and [*key*] is the public certificate key.

Move this certificate to the `TrustedCertificates\certs` folder on the Perception Server machine at this location:

`C:\ProgramData\GE_Energy\Perception\TrustedCertificates\certs`

2.6 Troubleshooting

2.6.1 .NET Framework is not listed when creating a new application pool

If the .NET Framework is installed but not listed as an available option in the .NET Framework version dropdown list when creating a new application pool, then it may just need to be reregistered on the machine. Try the following steps:

- Launch the Command Prompt as an Administrator
  - Click **Start > All Programs > Accessories**
  - Right-click the **Command Prompt** and choose **Run as administrator**

Note: If prompted, click **Yes** to the User Account Control

- Type the following commands (ensuring you use the correct path for the .NET Framework version you have installed).

32-bit machines:

- `cd C:\Windows\Microsoft.NET\Framework\v4.0.30319`
- `aspnet_regiis –ir`

64-bit machines:

- `cd C:\Windows\Microsoft.NET\Framework64\v4.0.30319`
- `aspnet_regiis –ir`

2.6.2 Modify the Perception Server hostname or IP address

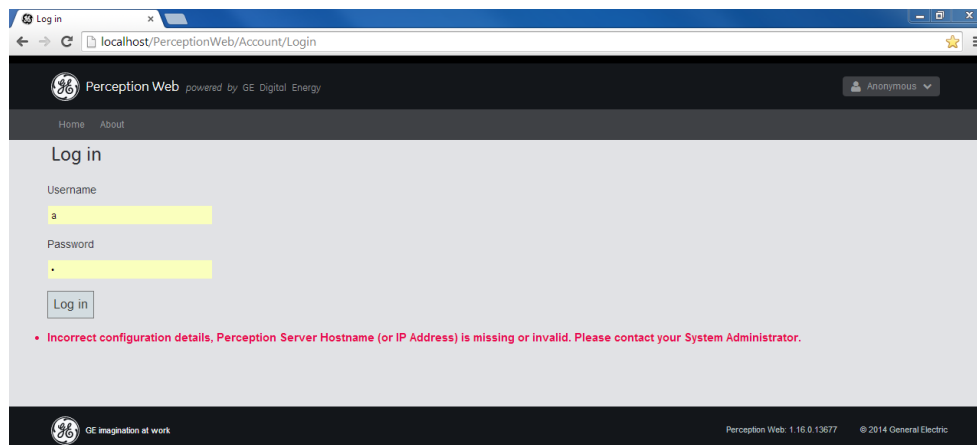If incorrect/missing configuration details occur, the following error message displays.

Figure 2-18: Incorrect configuration details

The Perception Server hostname or IP address is specified in the *Web.Config* file that can be found at the Perception Web install location. Open this file in any editor*, such as Notepad, and edit the following key:

```
<add key="PerceptionServerHostnameOrIpAddress" value="{name}"/>
```

Where {*name*} points to the Perception Server — this could be `localhost` or the IP address of the Perception Server.

*Note: The editor must be run with administrator privileges.

2.6.3   Perception Certificates missing or invalid

2.6.3.1 Server Certificate

If the Server certificate is missing or invalid, the following error message displays.
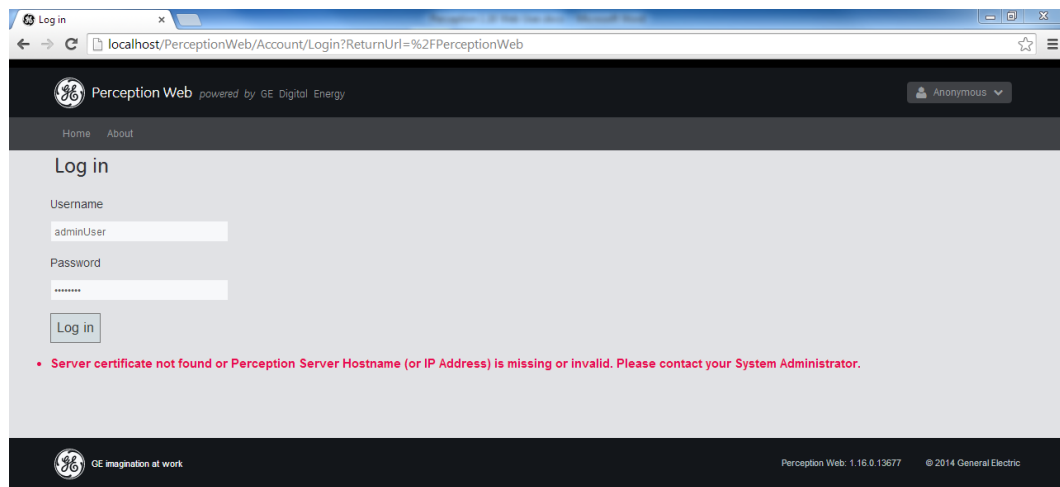
Figure 2-19: Server certificate missing

To resolve, copy a valid certificate to the `TrustedCertificates\certs` folder in the Perception Server install location or reinstall Perception Server to regenerate the certificate.

2.6.3.2 Web Client Certificate

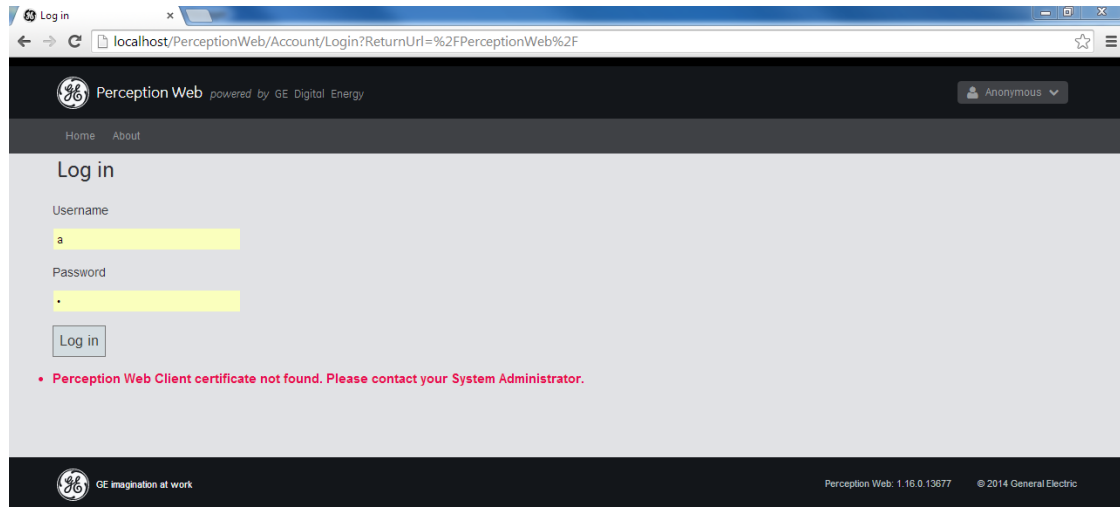If the Web Client Certificate is missing or invalid, the following error message displays.

Figure 2-20: Client certificate missing

To resolve, copy a valid certificate to the `TrustedCertificates\certs` folder in the Perception Web install location.

Another possibility is that the Application Pool has been incorrectly configured. To check, open IIS and ensure that the application pool is using a LocalSystem account (see Section 2.3) and/or restart the web site.

Alternatively, reinstall and re-launch Perception Web to regenerate the certificate.

2.6.4 Invalid Application Pool

If the application pool is missing or incorrectly configured, the web browser may show the following message as shown in Figure 2-21.
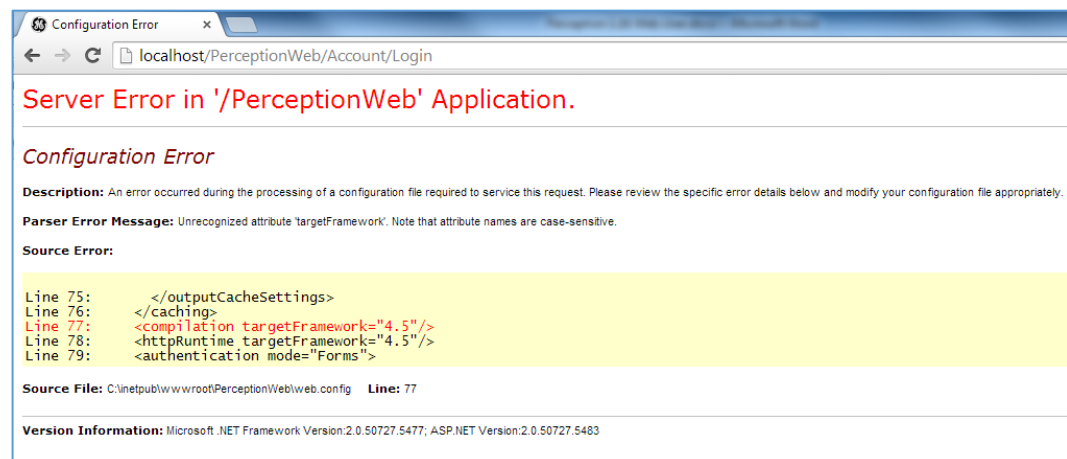
Figure 2-21: Browser error

To resolve, ensure that Perception Web is associated with the correct application pool and that the Application pool is configured as outlined in Section 2.3.

2.6.5 Other Issues

Known Issue	Resolution
Perception Web installer: after selecting an application pool, it reverts to another application pool.	Reselect the intended application pool.
HTTP Error 401.2 - Unauthorized	This can happen when trying to view Perception Web from a browser. Anonymous Authentication and Forms Authentication must be enabled for IIS to resolve this.

Unable to see ASP.NET v4.0 or 4.5 in Perception Web installer application pool drop down or available application pools in IIS manager	Ensure the correct features are enabled as described in section 2.2.
	
	1. Close IIS manager (if open).
	2. Run Command Prompt as Administrator.
	3. In the Command Prompt, type (for x64 Windows):
	`cd C:\Windows\Microsoft.NET\Framework64\v4.0.30319`
	or (for x86 Windows):
	`cd C:\Windows\Microsoft.NET\Framework\v4.0.30319`
	and press `Enter`.
	4. Type `aspnet_regiis -ir` and press `Enter`.
	5. A message confirms that the configuration of IIS Framework 4.0 has started.
	6. Restart IIS.

Perception Web Images / Icons not displaying	After installing and configuring Perception Web, some images and icons are not displaying on the web pages (Ranking arrows, pie chart, device icons). Steps to resolve the issue: 1. Open Control Panel and select **Add/Remove Windows features** 2. Enable the IIS feature **Static Content** under Common HTTP Features. 3. Restart IIS
Perception Web installer fails for non-English Windows	On some non-English Windows environments the Perception Web installer fails to complete. At the stage when you select the .Net 4.0 application pool and click Next, a message appears stating (ASP.NET v4.0) is not supported. This occurs because the decimal place symbol set in the Windows environment is not "`.`" Steps to resolve the issue: 1. In the Windows environment, open the control panel. 2. Click on **Region and Language** and then click on **Additional settings**. 3. Change the Decimal symbol to "`.`" and click **OK**. 4. Restart the Perception Web installer.

3   USING PERCEPTION WEB

3.1   Introduction

Perception Web is designed to connect with a database that contains the sampling data from the monitoring devices. In a production environment, the database typically resides at a remote location on a distinct web server. The Perception Web client renders this data in a web-friendly format across several platforms including mobile devices. However, the read-only nature of the web client means no modifications are possible.

Note: To customise the data or alter any device settings, you must use the standalone software application, Perception Desktop.

3.2   Fleet Overview
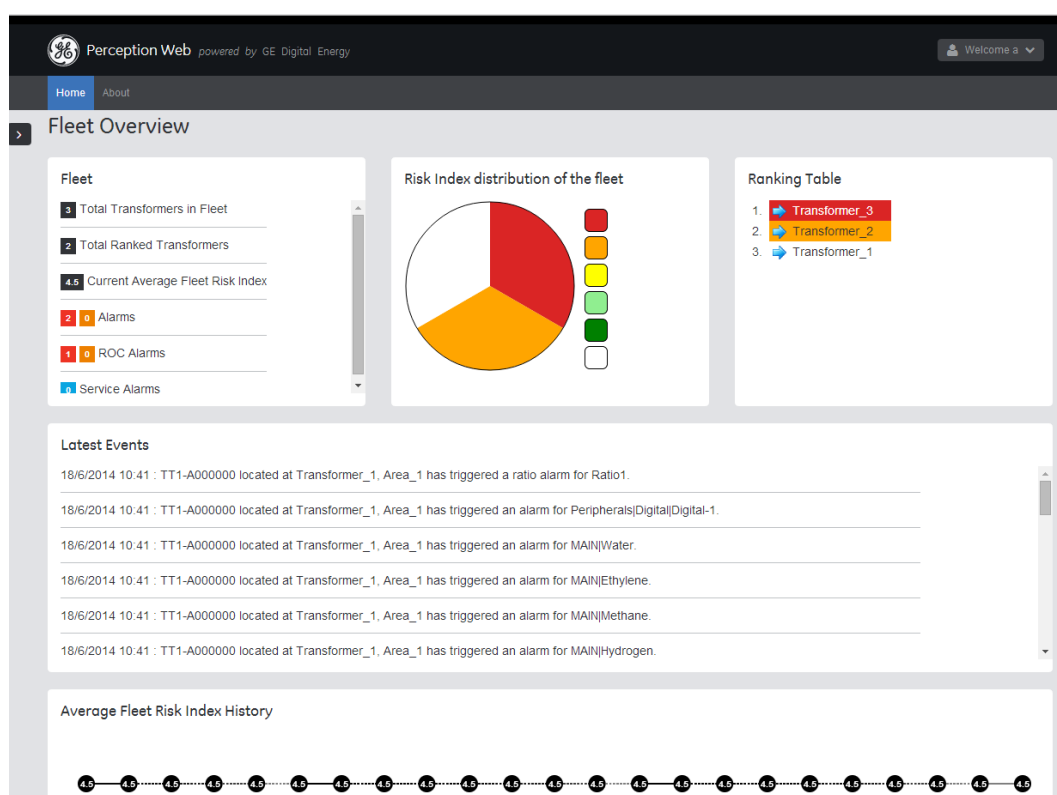
Figure 3-1: Perception Web home page

The Perception Web home page presents an overview to the general state of health of the entire transformer fleet. It is divided into the following sections:

- **Fleet** — provides a summary count of the number of transformers in the fleet, the number that are ranked or in need of attention, and a count of the various alarms that have been triggered.

- **Risk Index distribution of the fleet** — provides a pie chart depicting the risk distribution across the entire fleet. Click the colour-coded legend for a definition and summary count. Red or amber slices present the most risk (or have the most serious defects) while green slices present the least risk (or have no serious defects). White slices (or the absence of colour) denote those transformers that have yet to be evaluated.

- **Ranking Table** — provides a colour-coded ranking of all transformers according to their calculated risk index. Those listed at the top (in red/amber) present the most risk (or have the most serious defects) while those listed at the bottom (in green) present the least risk (or have no serious defects). The absence of colour coding denotes that the transformer is yet to be evaluated. Clicking a transformer opens the transformer dashboard.

- **Latest Events** — provides a log-style entry for any events that occur during the life of the transformer. This could be anything from a triggered alarm to a user-initiated action.

- **Average Fleet Risk Index History** — provides a timeline to track the overall health of the transformer fleet over time. This timeline calculates and shows the average health risk index across the entire transformer fleet.

3.3   Asset Explorer

The Asset Explorer is used to visualise the network of transformers and devices being monitored, and while it can be configured to display a hierarchy of areas, substations, transformers and devices – this can only be performed in Perception Desktop.

Click the 'right-pointing arrow' (top left) as shown in Figure 3-2 to open the Asset Explorer.

Note: To hide the Asset Explorer, click the left-pointing arrow.
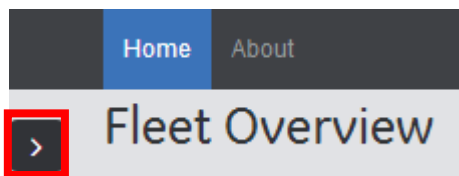
Figure 3-2: Opening the Asset Explorer

The Asset Explorer uses a tree-like structure to represent the hierarchy of assets in the database as shown in Figure 3-3. The tree-like structure provides a logical means of organising the assets and a useful means by which to navigate the hierarchy and find an asset.
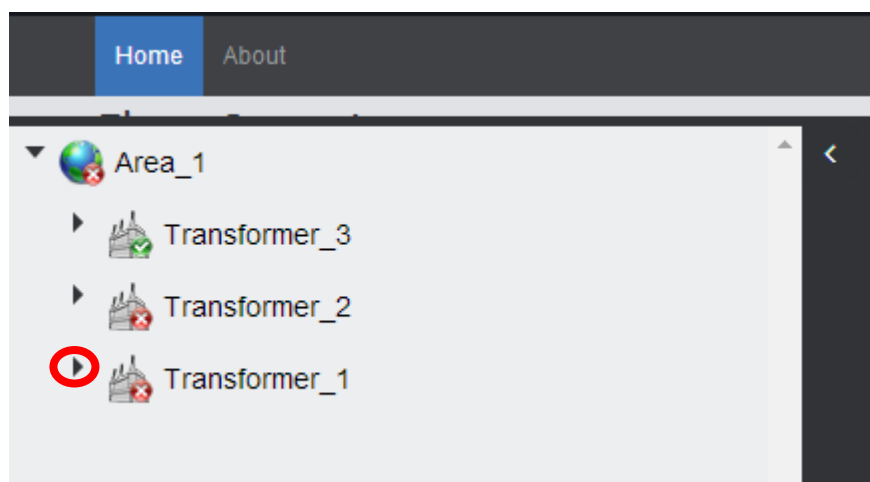
Figure 3-3: Asset Explorer

Each node in the tree represents an asset (denoted by the type of icon). Click a side right-pointing arrow, as shown in Figure 3-3, to expand a node and reveal its hierarchy

below, as shown in Figure 3-4. Typically, an 'Area' sits at the top of the hierarchy, while a 'monitoring device' sits at the bottom of the hierarchy, as shown in Figure 3-4.
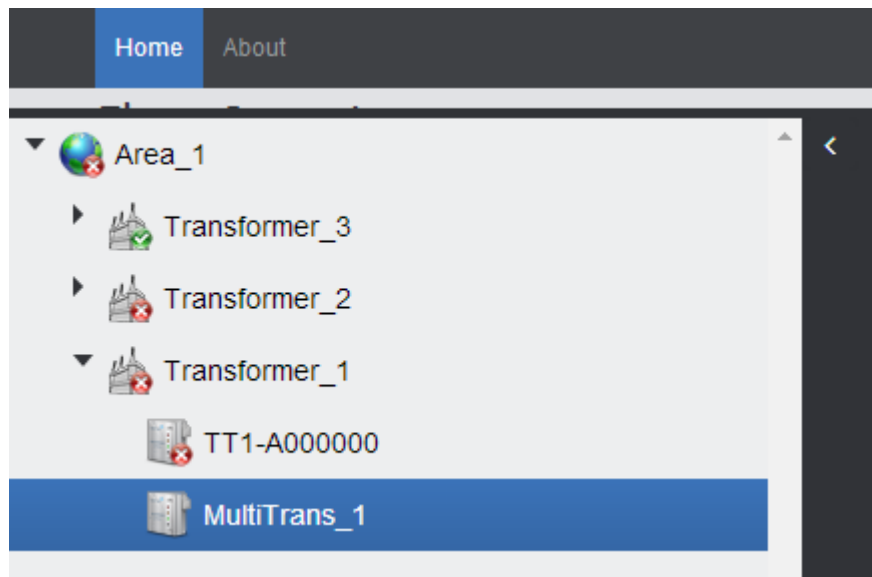

Figure 3-4: Asset Explorer - the asset hierarchy

The asset icons (or nodes) have a status indicator:

- Green Tick: All monitored parameters within bounds.

- Amber Exclamation Mark: A parameter(s) has exceeded the High or Low thresholds.

- Red Cross: A parameter(s) has exceeded the "High-High" or "Low-Low" or Ratio thresholds.

- Purple: Indicates that there is uncertainty in the latest measurement accuracy or the latest measurement is considered to be in error. Refer to the device data table.

- Blue: Indicates the device has experienced a fault and requires a service.

Note: The device status is reproduced up the asset tree so that the related Transformer, Substation and Area also reflect the status of its worst subordinate device.

3.4   Dashboards

Click on an asset node for more information. Figure 3-5 shows a Transformer dashboard. Every transformer gets a dedicated page containing key transformer information, such as its risk index, ranking and other parameters, such as alarms and load current. Listed below are any attached monitoring devices.
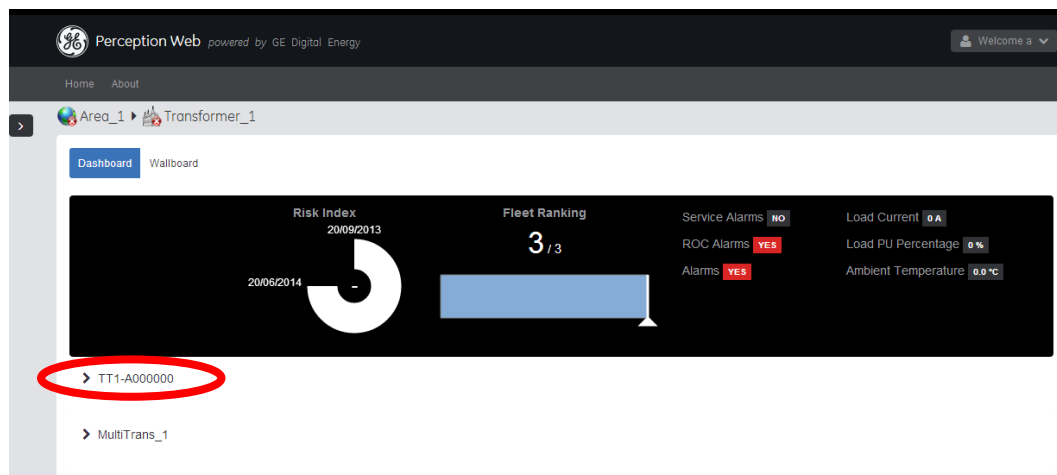
Figure 3-5: Transformer Dashboard

Click on the relevant monitoring device as shown in Figure 3-5 and scroll down if required to see the data aggregation and analysis as shown in Figure 3-6.
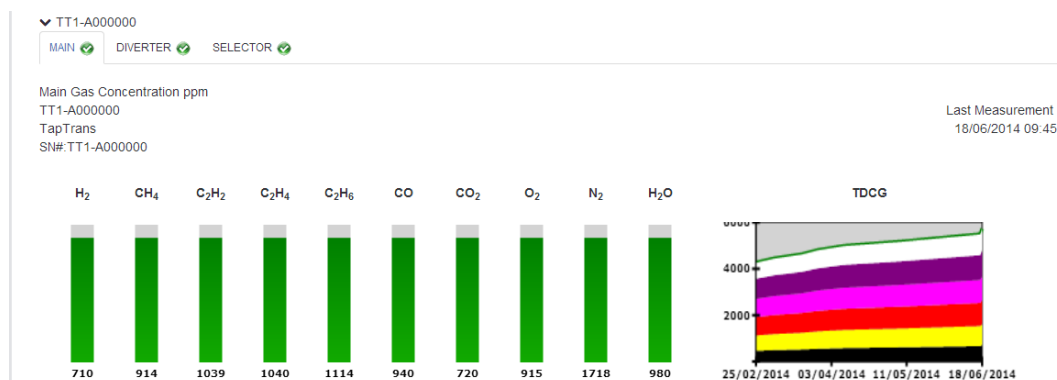
Figure 3-6: TAPTRANS monitoring data

Figure 3-7 shows the cooling information for an MO150 device.
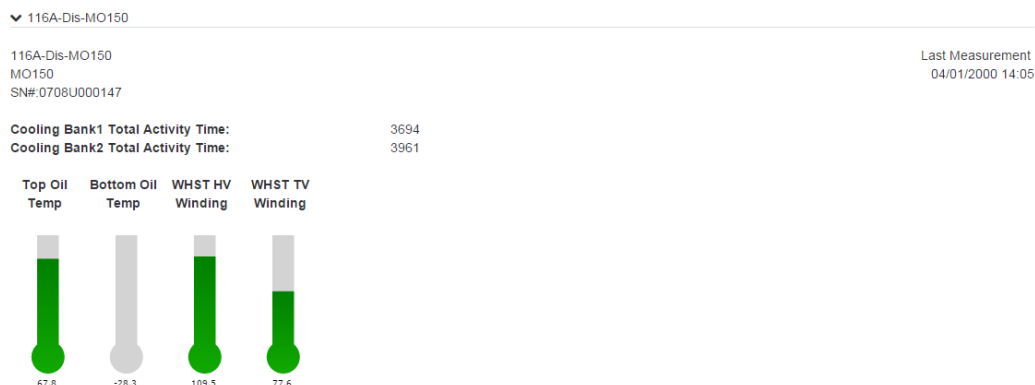
Figure 3-7: MO150 cooling information

3.5   Wallboards

A wallboard displays all assets and their corresponding status on a map. This provides an 'at-a-glance' geographic view of the assets at any moment in time, but the wallboard needs to be refreshed manually for any updates to show.

Wallboards can be rendered at the Transformer, Substation and Area levels. However, this needs to be preconfigured in Perception Desktop. Once setup, click **Wallboard** to see the configured image. In this example, Figure 3-8 shows a Transformer Wallboard on an image with two attached monitoring devices.

Note: If a wallboard is needed to continuously monitor the condition of assets, for example, in a control room, it's better to use the Perception Desktop wallboard as it dynamically updates.
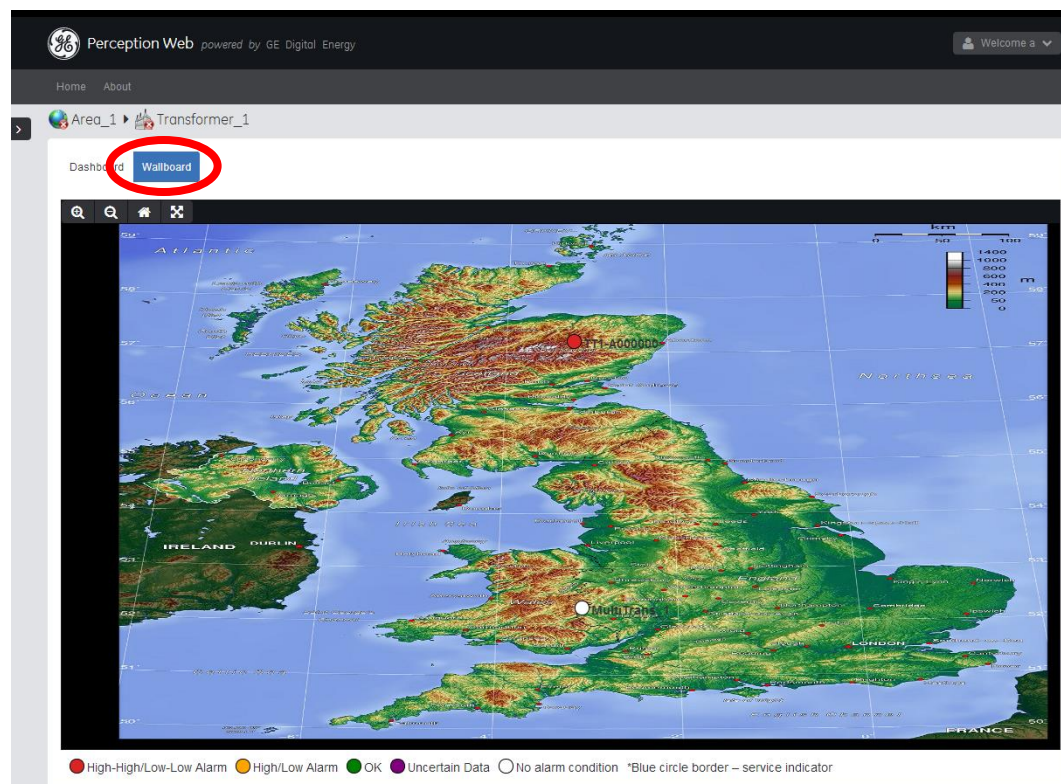
Figure 3-8: Transformer Wallboard

3.6   Options

The **Home** option returns you to the 'Home' page with the 'Fleet Overview' summary information as shown in Figure 3-9.
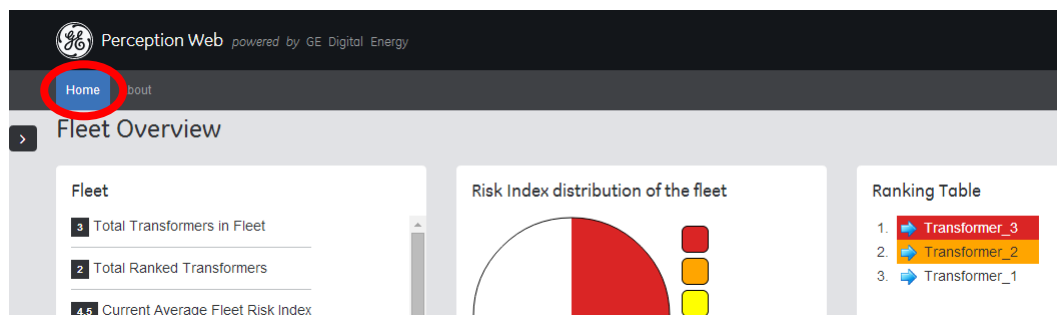
Figure 3-9: Home page

The **About** option takes you to the 'Release Notes' and 'Licenses' page as shown in Figure 3-10.
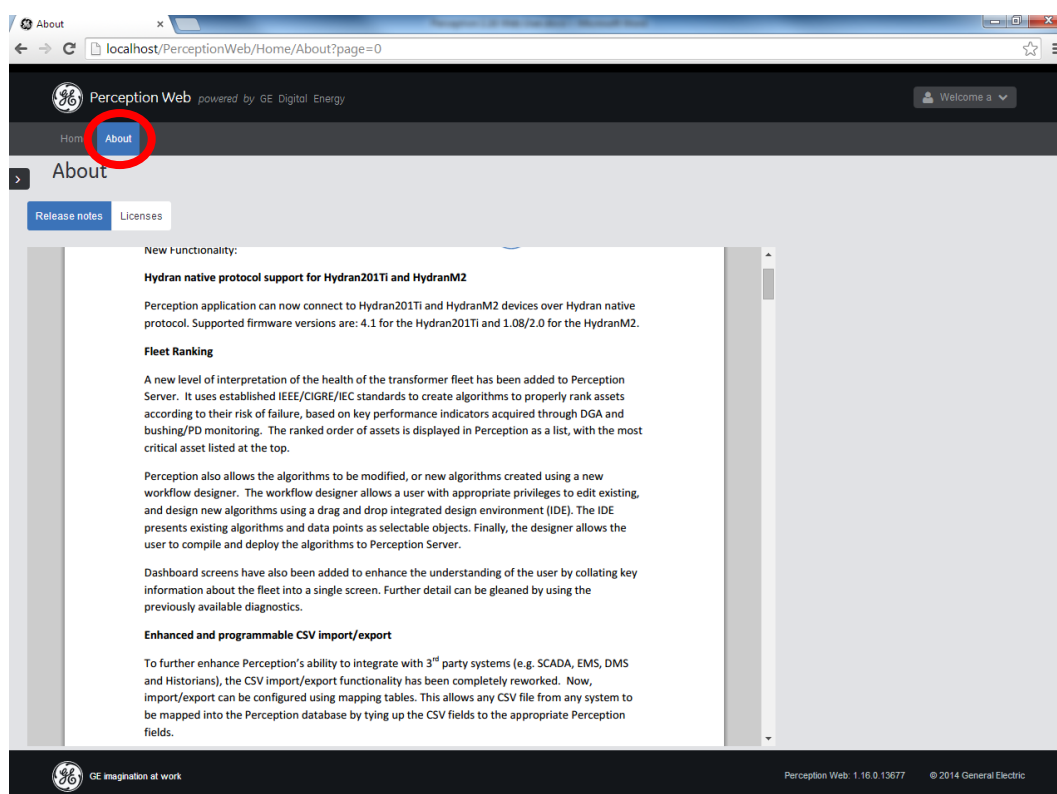
Figure 3-10: About page

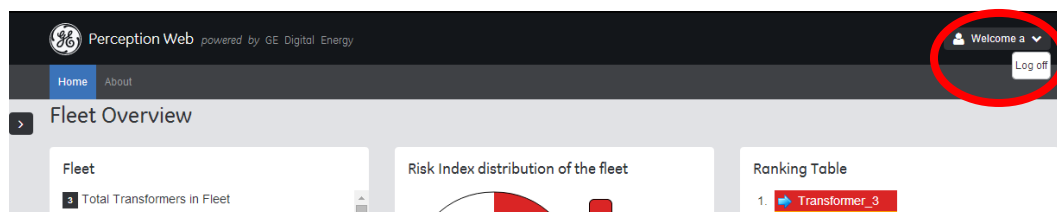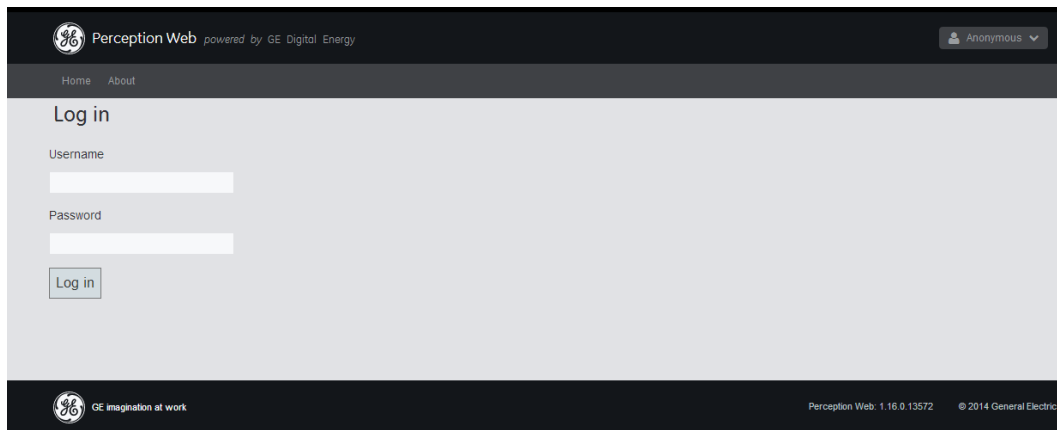The **Welcome** 'User' option shown in Figure 3-11 allows you to log off.

Figure 3-11: Log off option

You are returned to the 'Log in' page as shown in Figure 3-12.

Figure 3-12: Login page

Also note that every web session expires after a period of inactivity (defined as 10 minutes). However, Perception Web prompts you prior to logging out as shown in Figure 3-13.
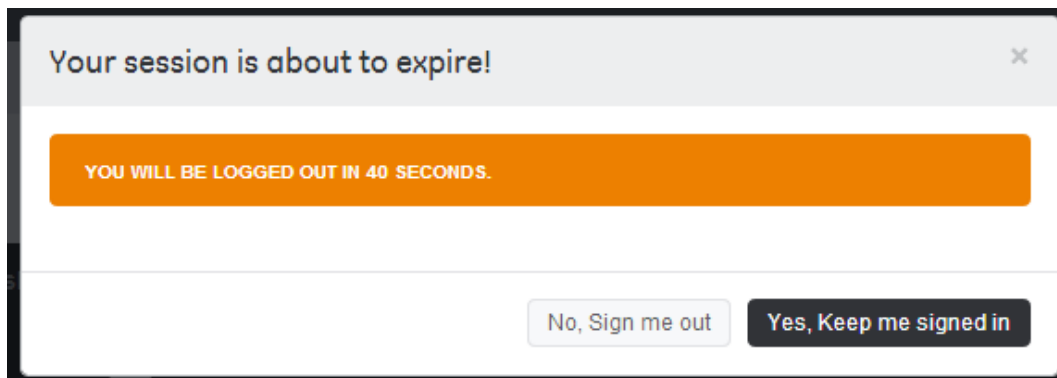
Figure 3-13: Session expiry

Appendix A   Installing Perception Web on Windows Server 2008

The following steps outline how to install and configure Perception Web on Windows Server 2008.

- Log on to the Windows Server 2008 machine as an 'Administrator'.

- Go to **Start > Control Panel**.

- Select **Programs and Features** as shown in Figure A-1.
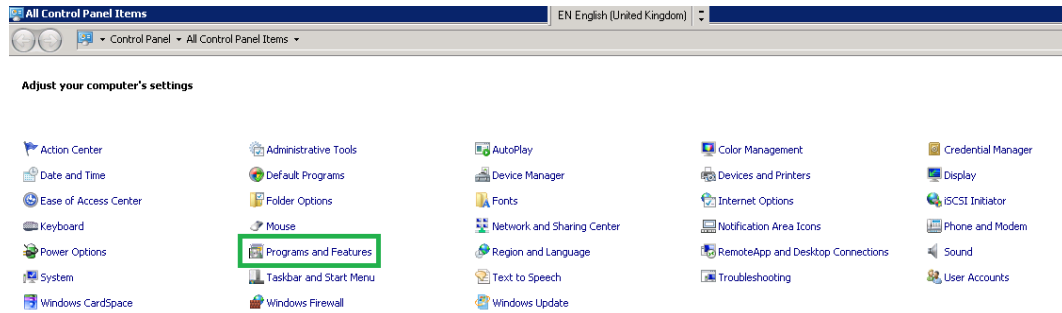
Figure A-1: Control Panel

- Select **Turn Windows Features on or off** as shown in Figure A-2.
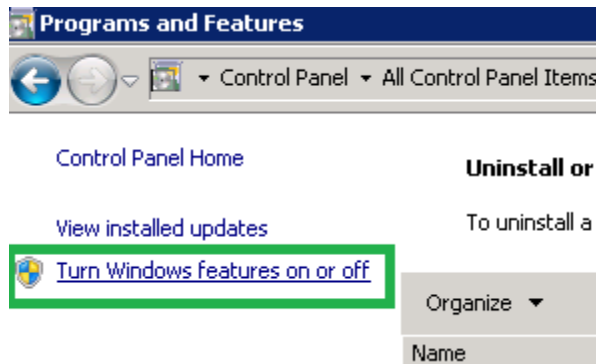
Figure A-2: Turn Windows Features on or off

- In the Server Manager application, select the **Roles** node and then click **Add Roles** as shown in Figure A-3.
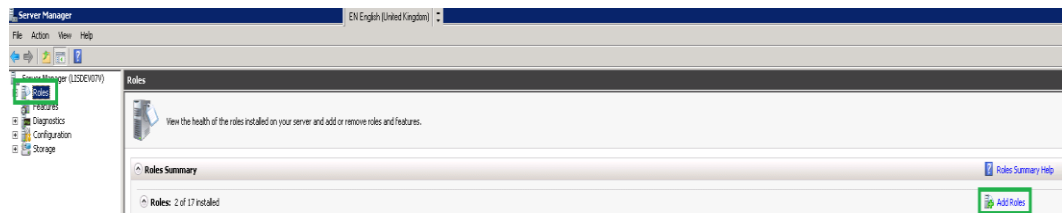
Figure A-3: Add Roles

- In the Add Roles Wizard, click **Next** to proceed.
- On the Server Roles page, select the **Web Server (IIS)** option and click **Next** as shown in Figure A-4.
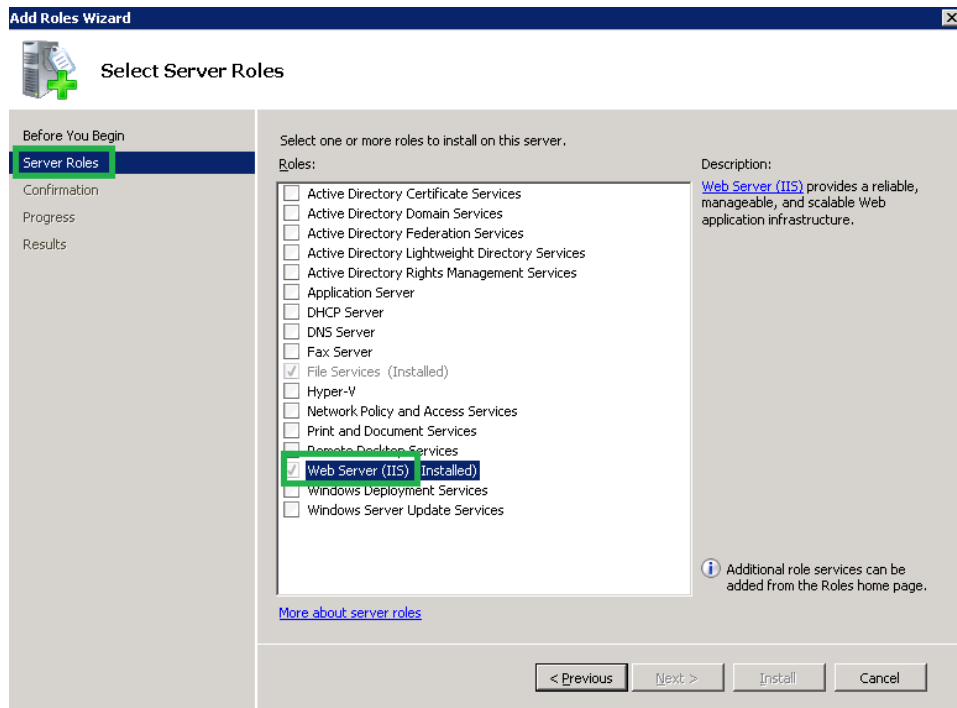

Figure A-4: Select Server roles

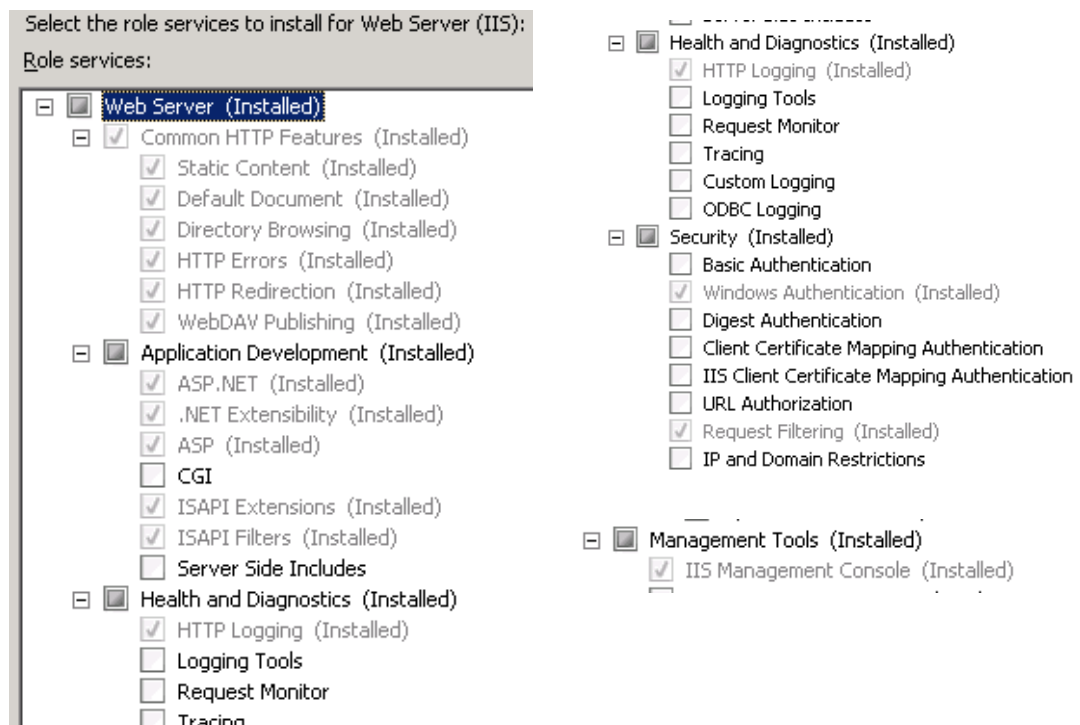- Select the following Role Services as shown in Figure A-5.

Figure A-5: Role Services

- Click the **Install** button to complete the Wizard and then close the Server Manager application.

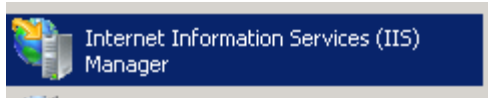- Start the **Internet Information Services (IIS)** Manager as shown in Figure A-6.

Figure A-6: Launch IIS Manager

- In the Connections pane, select the **Application Pools** node to view all the available application pools as shown in Figure A-7.
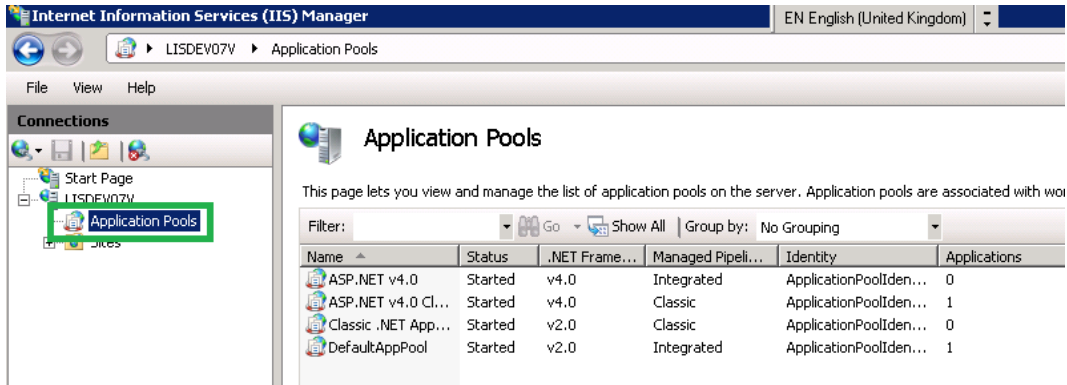

Figure A-7: Application Pools

- Right click on the **ASP.NET v4.0** application pool and select **Advanced Settings** as shown in Figure A-8.
  - ➢ Set 'Enable 32-Bit Applications' to **True**.
  - ➢ Set 'Managed Pipeline Mode' to **Integrated**.
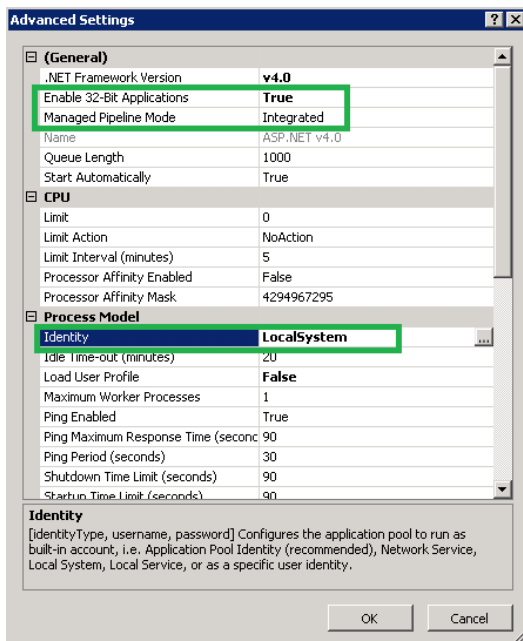 - ➢ Set 'Identity' to **LocalSystem**.

Figure A-8: Advance Settings

- Click **OK** to save the new settings and then close the IIS Manager.

- Lastly, when you run the Perception Web installer ensure that you select the **ASP.NETv4.0** application pool as shown in Figure A-9.
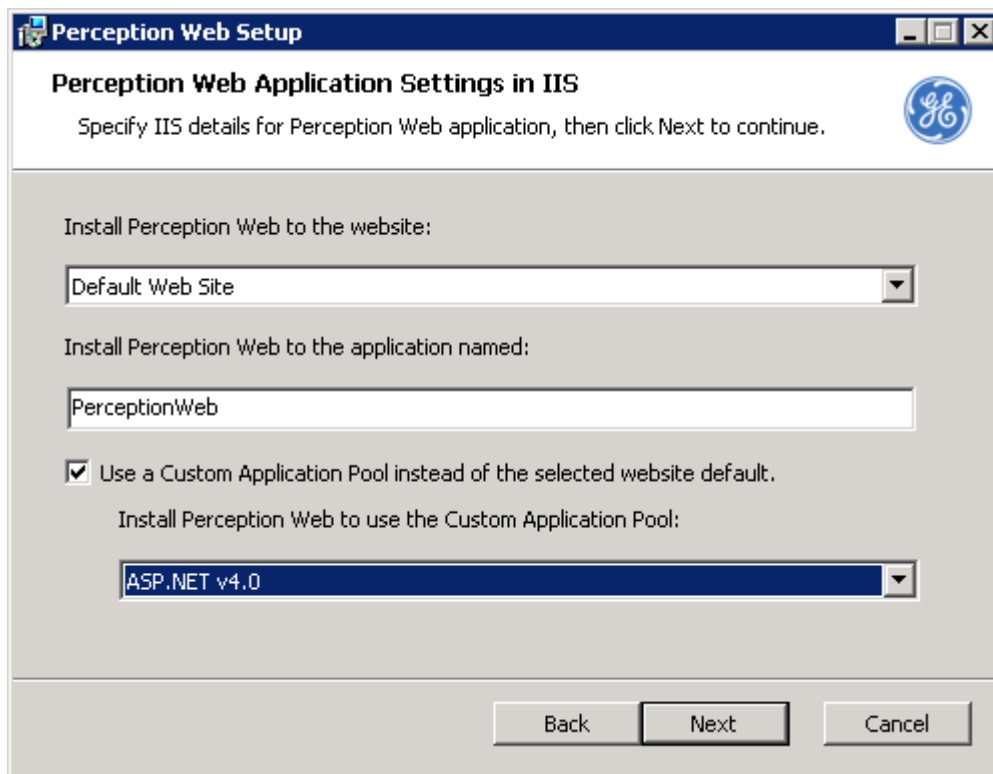

Figure A-9: Perception Web Application Settings in IIS

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