

PI Vision – Migrating PI ProcessBook Displays

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Introduction

This lab is designed for people who already have used PI ProcessBook and PI Vision. Students should already be familiar with how to navigate displays in both PI ProcessBook and PI Vision and understand how PI ProcessBook and PI Vision are able to leverage AF Templates.

Approach

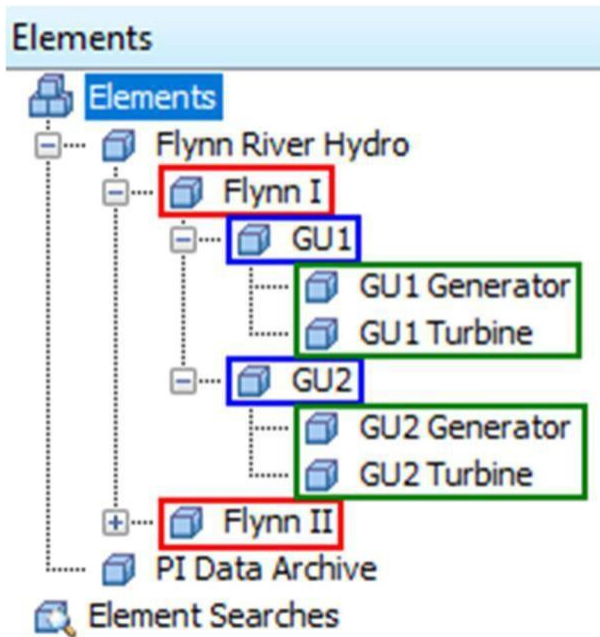
Specific questions or scenarios will be presented to solve primarily using OSIsoft PI ProcessBook or PI Vision as your visualization and analysis tool. In addition, the PI ProcessBook to PI Vision Migration Utility will be used. More advanced features of PI Vision will have a strong reliance on AF so you will also need to use PI System Explorer (PSE). If you are stuck, ask one of the lab monitors for assistance.

Why Use the PI ProcessBook to PI Vision Migration Utility?

PI ProcessBook is a 25-year-old product that has begun to show its age. PI Vision is our leading visualization tool built to leverage the latest PI System capabilities where PI ProcessBook has fallen behind. We know it takes a lot of hard work to build out PI ProcessBook displays, and we want to help move that work over to our modern visualization tool and take advantage of the benefits of PI Vision. While it may seem like a challenging task, this lab will give you the knowledge and practice to be confident in using the PI ProcessBook to PI Vision Migration Utility.

Scenario: Flynn River Hydro

You have been hired as a PI Administrator at Flynn River Hydro and you are tasked with migrating their PI ProcessBook displays to PI Vision. Luckily the company has built out AF databases with templated AF Assets that have been used in the PI ProcessBook displays. The AF structure features three main levels, Hydro Unit, Generation Unit, and Equipment (Generator/Turbine).



Red – Hydro Unit

Blue – Generation Unit Green –
Equipment

You know that this AF structure has been utilized in the PI ProcessBook displays and you would like to keep that functionality in the migrated PI Vision displays.

Note: The AF database used in these exercises is a slight modification of the Hydro Plant Monitoring Asset Based PI Example Kit available on our learning platform (learning.osisoft.com):

<https://learning.osisoft.com/asset-based-af-example-kits/349384>

Exercises

Exercise 1: Review Existing PI ProcessBook Displays

Exercise Objectives:

Examine PI ProcessBook functionality

Scenario:

Your first assignment is to review the existing set of PI ProcessBook displays that the company currently uses to make sure the display content is properly migrated into PI Vision. The company has a set of displays which are used to monitor Flynn River Hydro plant and equipment, located in C:\ProcessBook\Flynn. The company also has a display which IT uses to monitor the health of the PI Data Archive, located in C:\ProcessBook\IT.

Part 1: PI Data Archive Monitoring Display Approach:

1. Open the PI_Data_Archive_Monitoring.pdi display located in C:\ProcessBook\IT
2. **Select Visual Basic Editor  and double click on This Display under the C:\ProcessBook\IT\PI_Data_Archive_Monitoring.pdi VBAProject to open the VBA code. What does this code do?**
3. Close the Visual Basic Editor and use the PI_Data_Archive_Monitoring.pdi display to answer the following questions

Questions:

1. How many Unflushed Events are currently in the write cache?
2. What is the Point Count in the Base Subsystem?
3. **What is the approximate peak of the PI Server CPU over the last 20 minutes? Hint: double-click the PI Server CPU trend to maximize it**

Part 2: Flynn River Hydro Displays Approach:

1. Open the PG_Flynn_Home.pdi display located in C:\ProcessBook\Flynn
2. Use the navigation buttons to open the other Flynn PI ProcessBook displays
3. Use the Flynn River Hydro displays to answer the following questions

Questions:

1. What is the current Penstock Flow at plant Flynn II?
2. Which Generation Unit currently has the highest Power Generated?
3. Which Generator currently has the lowest Oil Level?
4. What is the approximate peak Water pH Intake at GU3 Turbine in the last 8 hours? Approximately when did this peak occur?
Hint: hover over the value to see the summary statistics

Exercise 2: Analyze and Migrate PI ProcessBook Displays

Exercise Objectives:

Use the PI ProcessBook to PI Vision Migration Utility to migrate PI ProcessBook displays to PI Vision Understand the configuration and reporting options available in the Migration Utility

Scenario:

Now that you have reviewed the PI ProcessBook displays that the client uses, you are ready to use the PI ProcessBook to PI Vision Migration Utility to convert these displays to native PI Vision displays. You would like to preserve the folder and navigation structure of the existing displays.

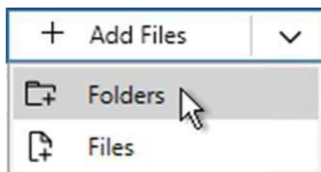
Note: The PI ProcessBook to PI Vision Migration Utility User Guide is available on Live Library and as a bookmark in Chrome:

https://livelibrary.osisoft.com/LiveLibrary/web/ui.xql?action=html&resource=publist_home.html&pub_category=PI-ProcessBook-to-PI-Vision-Migration-Utility

Approach:

Part 1: Analyze the PI ProcessBook Displays


1. Open the PI ProcessBook to PI Vision Migration Utility
2. Click Add Files and select Folders:



3. In the Browse for Folder window, select the C:\ProcessBook folder and click OK
4. Select the checkbox next to the ProcessBook folder or Select All in the bottom left to select all folders and files
5. Click Run Analysis and wait for the Analysis completed message Part 2: Review the

Analysis Results

6. In the Analysis Results pane, expand the categories that appear to view the extent to which the files can be migrated

7. Hover over the ⓘ icon next to each category to review each category definition
8. Hover over the icons in the Issues column to review each migration limitation
9. The PI_Data_Archive_Monitoring display contains VBA , which is not supported in PI Vision. Click Export VBA at the bottom of the Analysis Results pane.
10. After the Export completed message is displayed, click View Reports and select Open Reports Folder to view the associated .vba file in notepad.
11. In the Reports Folder, open the MigrationAnalysis.csv file to view the migration analysis results in detail.
12. Click Select All at the bottom of the Analysis Results pane

Note: In order to preserve links between PI ProcessBook displays, they must be migrated in the same operation

13. Click Migrate to open and complete the Migration Settings window:
 - a Connect to the PI Vision Server: enter <https://pivision/pivision> and click Connect
 - b Destination PI Vision folder: <Home>
 - c Target Display Owner: pischool\student01
 - d Display Sharing Access: World
 - e Select Persist folder structure from migrated items
14. Click OK and wait for the Migration completed message
15. Click View Reports and select Migration Report to view the migration results in detail

Exercise 3: Review Migrated PI Vision Displays

Exercise Objectives:


Examine PI Vision functionality

Validate migration configuration options in PI Vision

Scenario:

Now that the PI ProcessBook displays have been migrated to PI Vision, you need to examine the migrated PI Vision displays. The users are not very familiar with PI Vision, so you need to be able to demonstrate how the new PI Vision displays work.


Part 1: PI Data Archive Monitoring Display Approach:

1. Use the shortcut on the desktop to launch PI Vision using Chrome.
 - a Alternatively, start Chrome and navigate to <https://pivision/pivision>
2. **Note the folder structure in the lower left panel. Did the folder structure persist from the PI ProcessBook files? Select the IT folder within ProcessBook on the left side panel**
3. Click Edit display settings  in the PI_Data_Archive_Monitoring display to open the Display Settings window. Did the migration settings apply to this display?
4. Close the Display Settings window. Click the PI_Data_Archive_Monitoring display to open it and answer the questions below

Questions:

1. How many Unflushed Events are currently in the write cache?
2. What is the Point Count in the Base Subsystem?
3. **What is the approximate peak of the PI Server CPU over the last 20 minutes? Hint: double-click the PI Server CPU trend to maximize it**

Part 2: Flynn River Hydro Displays Approach:

- 1. Back in the PI Vision homepage, select the Flynn folder within ProcessBook on the left side panel**
- 2. Click Edit display settings  in the PG_Flynn_Home display to open the Display Settings window. Did the migration settings apply to this display?**
- 3. Close the Display Settings window. Click the PG_Flynn_Home display to open it**
- 4. Use the navigation buttons to open the other Flynn PI Vision displays**
- 5. Use these Flynn displays to answer the following questions**

Questions:

- 1. What is the current Penstock Flow at plant Flynn II?**
- 2. Which Generation Unit currently has the highest Power Generated?**
- 3. Which Generator currently has the lowest Oil Level?**
- 4. What is the approximate peak Water pH Intake at GU3 Turbine in the last 8 hours? Approximately when did this peak occur?**

Exercise 4: Complete the PI Vision Displays

Exercise Objectives:

Use AF to create analyses to add to the PI Vision display

Use PI Vision to edit the migrated PI Vision displays

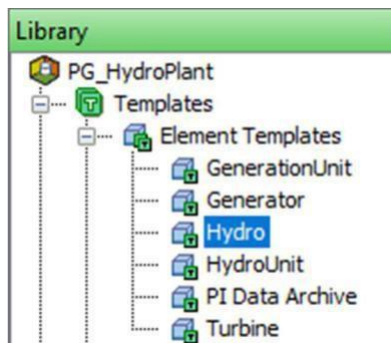
Scenario:


After examining the newly migrated PI Vision displays, you see that there is some data missing from the original PI ProcessBook displays. Specifically, in the PG_Flynn_Plant PI Vision display, there is some calculation data missing in the upper left corner. You know from the migration results that there are datasets in the original PI ProcessBook display. Since you want to be able to use these calculations in other client tools, you will create AF analyses for these calculations. You also need to update the banner of the PI_Data_Archive_Monitoring display as it utilizes VBA. Since the timebar in PI Vision shows us the time range of the display, you will replace this header with a static header.

Approach:

Part 1: Update the PG_Flynn_Plant display using AF analysis

1. Open PI System Explorer and select the PG_HydroPlant database
2. Navigate to Library and go to Templates > Element Templates > Hydro



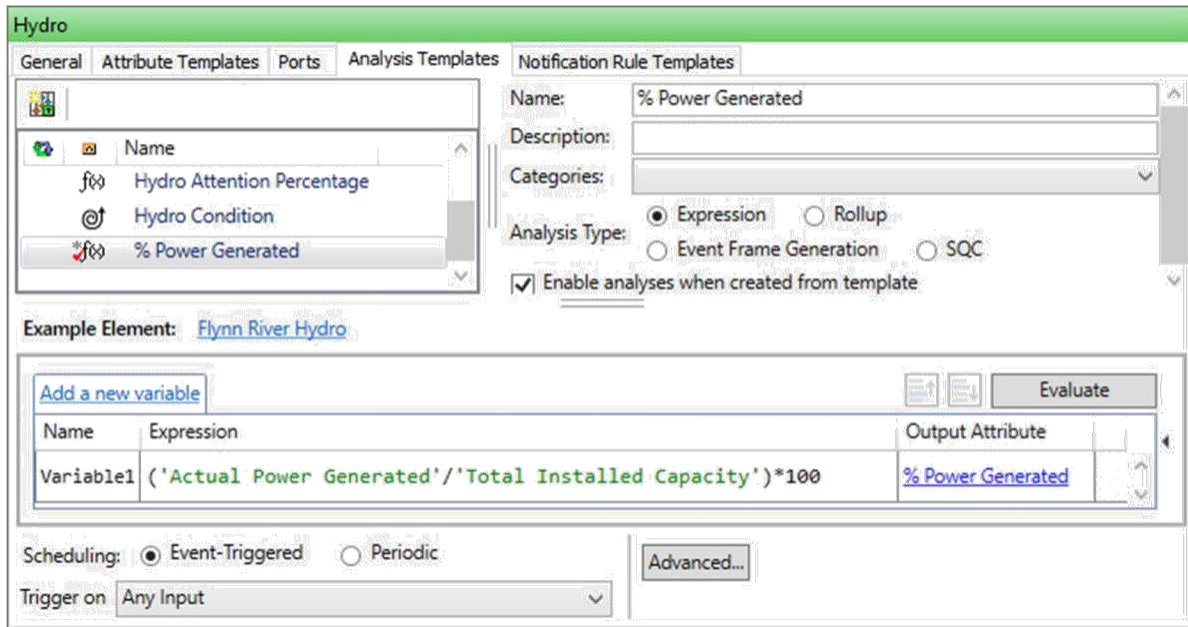
3. In the Analysis Templates tab, create two new expression analysis templates  with the following properties:

Analysis 1: % Power Generated

Expression: ('Actual Power Generated'/Total Installed Capacity)*100 Output Attribute (Map > New Attribute Template)

- o Save Output History: No
- o Name: % Power Generated

Scheduling: Event-Triggered



Analysis 2: Min/Max Power Generated

Expression 1: TagMin('Actual Power Generated', '-1h', '') Output Attribute (Map > New Attribute Template)**

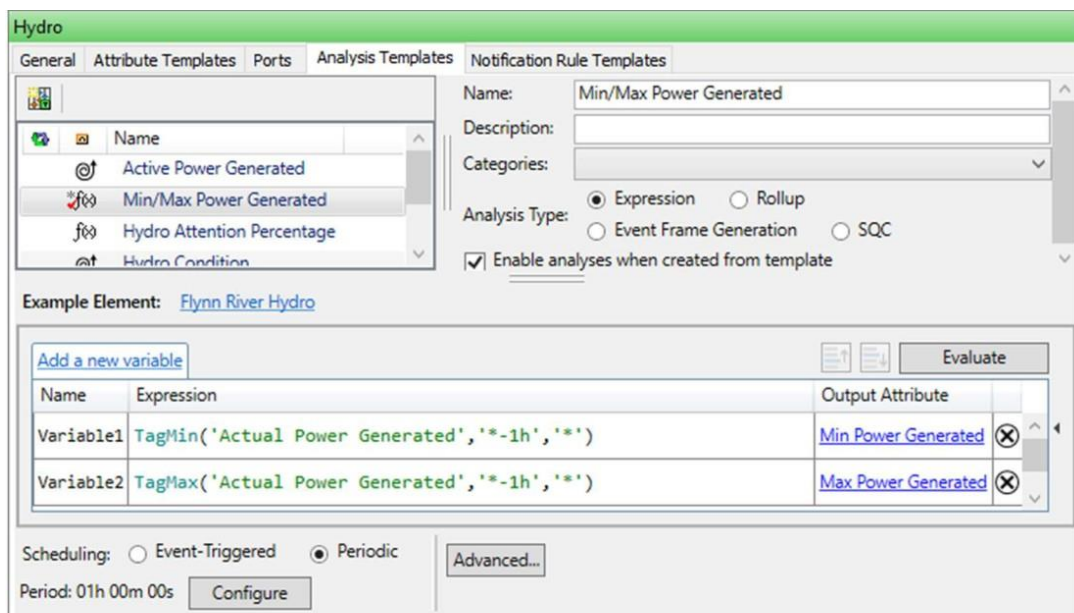
- Save Output History: Yes
- Name: Min Power Generated


Expression 2: TagMax('Actual Power Generated', '-1h', '') Output Attribute (Map > New Attribute Template)**

- Save Output History: Yes
- Name: Max Power**

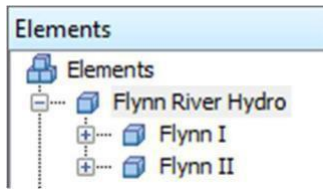
Generated Scheduling: Periodic

Period: 01h 00m 00s

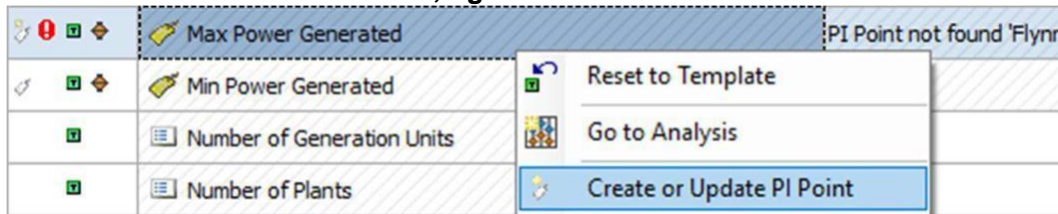


4. Check In your changes  Check In

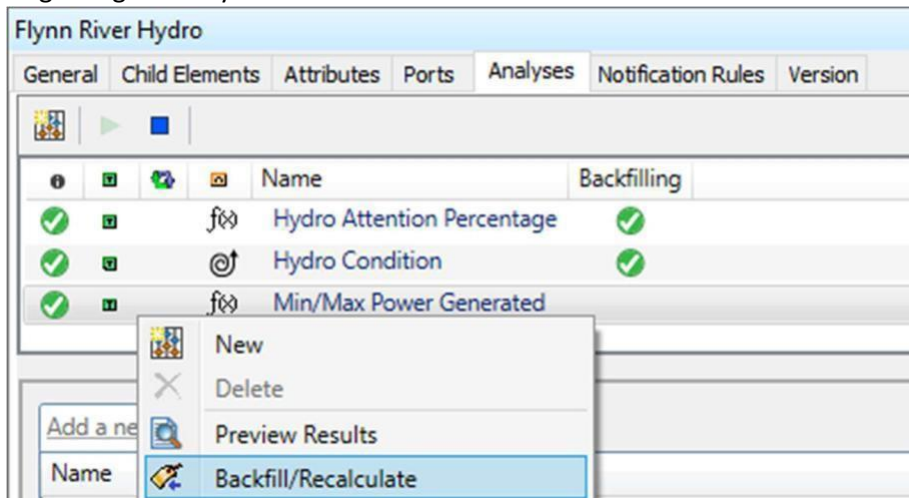
5. Go to Elements > Flynn River Hydro



6. In the Attributes tab, if you see “PI Point not found” errors for the Min Power Generated and/or Max Power Generated attributes, right-click each attribute and select Create or Update PI Point



7. In the Analyses tab, right click the Min/Max Power Generated analysis and backfill the analysis from the beginning of today until now



8. In PI Vision, open the PG_Flynn_Plant display and add value symbols of the newly created % Power Generated, Min Power Generated, and Max Power Generated attributes to replace the missing datasets and save your display

Part 2: Update the PI_Data_Archive_Monitoring display


9. In PI Vision, open the PI_Data_Archive_Monitoring display

10. Update the non-working date and time header with a header of your choice (ex. PISRVO1 PI Data Archive Monitoring) and save your display

Bonus: Edit the remaining PI Vision displays

As a bonus exercise, edit the other migrated PI Vision displays to better format the displays in PI Vision. Some suggestions are below, but feel free to make any other adjustments! Be sure to save the displays when finished.

PG_Flynn_Home

Adjust the 4 links and 3 arrows to be evenly spaced by selecting the symbols and going to  Arrange > Align Middle

PG_Flynn_Plant

Add the Generating Capacity attribute for the displayed Flynn I or Flynn II plant to the display as a Value symbol under the trend

Format the boxes surrounding Flynn River Hydro Power and Features to have different Border colors

Adjust the Penstock Opening and Penstock Flow value and text symbols so they are not overlapping

PG_Flynn_GenerationUnit

Increase the Font Size of the Generator Analysis and Turbine Analysis text symbols to 24 Add the Generation Unit Number of Attention Systems attribute for the displayed generation unit to the display as a Value symbol

PG_Flynn_Generator and PG_Flynn_Turbine



Format the Oil Level gauge symbol to show the scale in Format Gauge > Visibility > Scale
Change the text color of the Last Maintenance and Time Since Maintenance value symbols

Exercise 5: Migrate Another PI ProcessBook Display

Exercise Objectives:

Complete another migration using the PI ProcessBook to PI Vision Migration Utility

Scenario:

You have presented the migrated PI Vision displays to the other PI users at Flynn River Hydro, and they are excited to see the new visualization tool and its new capabilities. An engineer has created a ProcessBook display recently and would like to see how it works in PI Vision.

Approach:

- 1. Open the PowerGeneration.pdi file located on the Desktop. Examine this display in PI ProcessBook**
2. Use the PI ProcessBook to PI Vision Migration Utility to analyze and migrate the display. This display should be located in the Flynn folder in PI Vision.
3. Review the migrated PowerGeneration display in PI Vision and verify the migration settings and symbols have been preserved
4. Make any adjustments to the display in PI Vision, some suggestions are as follows:

Edit the background and font colors of the display to match the other Flynn displays

Increase the font size of the Flynn I, Flynn II, and Total text and value symbols

Add a Home text symbol to the display. Add a navigation link to this symbol to link to the PG_Flynn_Home display

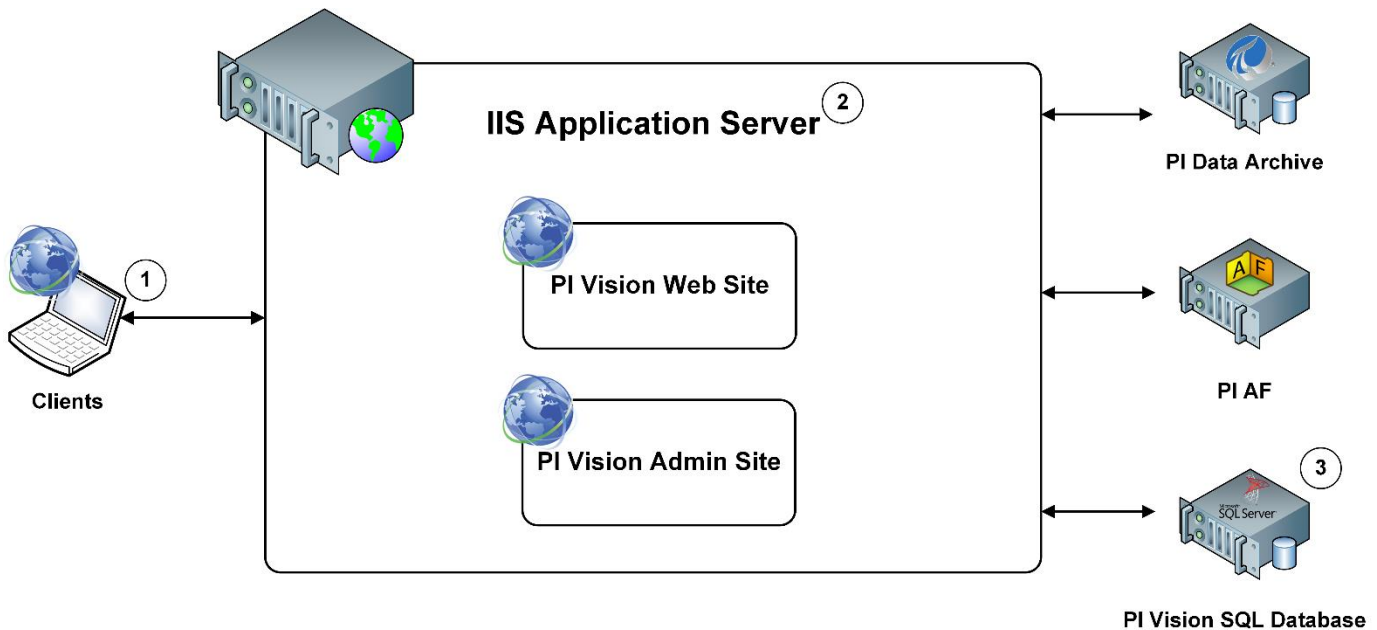
Install PI Vision 2020 (Optional Content)

Introduction

PI Vision Architecture

PI Vision is a web-browser based application that enables you to easily retrieve, monitor, and analyze process engineering information.

The main components of a PI Vision installation are:



1. **Clients** are individual PI Vision users accessing PI System data. PI Vision is supported by most modern browsers on a wide variety of devices, including tablets and phones running iOS or Android operating system.
2. **PI Vision IIS Application Server** provides the execution environment for PI Vision. The application server handles all application operations between users (clients) and PI Data Archive servers, PI AF servers and MS SQL Server.
3. **PI Vision SQL Database** on MS SQL Server stores user display settings and definitions. Display definitions include such data as a display name and display owner, symbols on the display, user permissions etc.

Since version 2020 (3.5.0.0) PI Vision no longer relies on PI Web API and PI Web API Indexed Search, that have been replaced by AFSearch, thus PI Web API is no longer part of PI Vision install kit. For more info see article [PI Web API Search Recommendations](#).

OSIsoft recommends that PI Vision uses the **SAME** MS SQL Server that PI AF uses. Otherwise, you can either install MS SQL Server on the same computer as PI Vision IIS application server or you can use a dedicated MS SQL Server installation.

OSIsoft strongly recommends that the PI Data Archive server(s) and PI AF server(s) be in the **SAME DOMAIN** as PI Vision IIS Application Server and MS SQL Server hosting the PI Vision SQL Database.

Detailed installation and configuration of PI Vision is described in [PI Vision Installation and Administration Guide](#).

PI Vision Data Flow

Example of a typical data flow that occurs as different architecture elements interact to provide the client with PI System data.

When searching for data in a new display:

1. When a user performs a search for a data item (asset, attribute, or PI point), the client sends a request for that data item to the PI Vision IIS Application Server. The request is relayed to the AF SDK which populates the search results retrieved from the PI Data Archive and PI AF Server.
2. Based on the search results, the user can create a symbol for the data item by dragging it onto the display. The symbol on the display does not yet contain any PI System data values.
3. Symbol creation triggers a request for PI data, which PI Vision IIS Application Server relays to PI Data Archive or PI AF. When PI System data returns to the client, the symbols on the display are populated with data values.
4. When a user saves the display, the display definition (display settings) is sent to the MS SQL Server and stored in the PI Vision SQL database.

When opening an existing display:

1. When a user opens an existing display, the client side sends a request for a display definition to the PI Vision IIS Application Server, which is relayed to the MS SQL Server. The MS SQL Server returns the display definition from which the client generates a display with symbols. The symbols do not yet contain any data values.
2. Symbol creation triggers a request for PI data, which PI Vision IIS Application Server relays to PI Data Archive or PI AF. When PI System data returns to the client, the symbols are populated with data values.

Pre-Installation Tasks

Hardware and Software Requirements

PI Vision IIS Application Server requirements

The requirements for the software on the machine the PI Vision IIS Application Server are:

- Microsoft Windows Server 2012 64-bit and later, incl. Server Core versions
- Microsoft Information Services (IIS) 8.0 and later
- Microsoft .NET Framework 4.8

The following table show the recommend hardware sizing based on the number of users (clients) connecting to the PI Vision IIS Application Server at the same time:

# of Users (Clients)	1 to 50	50 to 250	250 to 500
CPU: # of Cores	4	4	8
CPU: Speed (GHz)	2	2.5	3
RAM (GB)	6	12	24

MS SQL Server requirements

PI Vision requires MS SQL Server 2014 or above. All editions (Express, Standard, Enterprise) are supported.

PI System requirements

- PI Data Archive version 3.4.380 (the first version supporting Windows Integrated Security) and later
- PI AF version 2018 (2.10) and later

Client requirements

PI Vision clients need to use web browsers that are HTML5 compatible:

- Microsoft Internet Explorer 11
- Microsoft Edge 44 and later
- Google Chrome 76 and later
- Mozilla Firefox 69 and later
- Safari 11 and later

Prepare the Application Server

Video: [PI Vision 2020 Installation - Phase 1 - Prepare the Application Server](#)

This video demonstrates the steps to prepare the Application service to complete a fresh install of PI Vision 2020. It is divided into the following sections:

- Check System Requirements
- Prepare the PI Vision Application Server Computer
- Prepare SSL Access

Check System Requirements

The machine where we will install PI Vision is dedicated to hosting PI Vision. Verify that your machine meets the following hardware requirements, based on the number of PI Vision users:

# of Users	1 to 50	50 to 250
CPU (Cores)	4	4
CPU Speed (GHz)	2	2.5
Memory (GB)	6	12

Please note, you can use the PI Vision Administration website to generate a report that lists the number of users who have accessed PI Vision within a specific time range if you are unsure of your user base.

Verify that your machine meets the following software requirements:

- Windows Server 2012 64-bit or newer, including Server Core versions
- Microsoft Internet Information Services (IIS) 8.0, or later
- Microsoft .NET Framework 4
- Microsoft SQL Server 2014 (Express, Standard or Enterprise) or later to host the PI Vision SQL database

PI Vision 2020 supports the following versions of PI Data Archive and PI Asset Framework:

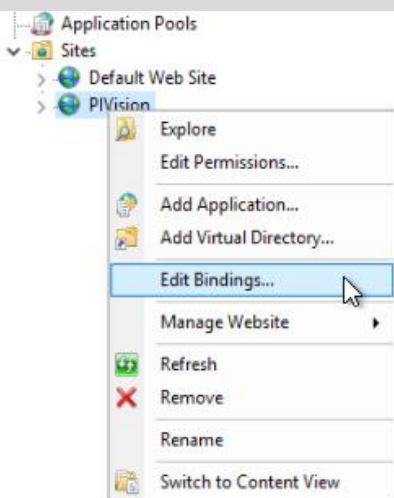
- PI Data Archive version 3.4.380 and later
- PI AF version 2018 (2.10) or later

Prepare the PI Vision Application Server Computer

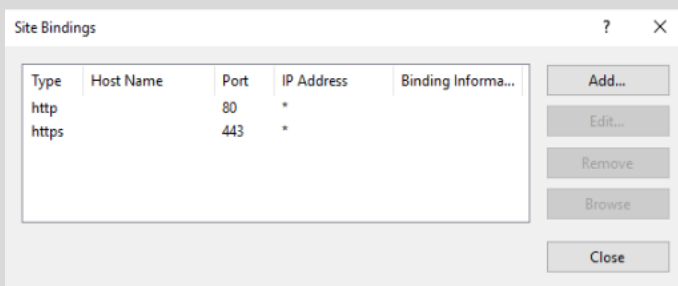
Now that we have verified that our machine meets all of hardware and software requirements, we need to prepare the PI Vision Application Server.

If you have not already done so, work with your IT team to make sure that you have the required ports **80** or **443** open for the PI Vision web server.

If the Web Server is dedicated only to PI Vision application, then it is possible to install it to the Default Web Site, but if the Web Server is shared with other web applications, third-party or OSIsoft's PI Manual Logger Web and RtReports Generator, it is recommended to install PI Vision to the dedicated website.



For new website it is necessary to assign bindings and their ports. HTTP protocol has default port 80 and HTTPS default port 443. If those ports are taken by another website, they cannot be used, and different port number must be assigned. Any other number must be specified in URL address.



Download the PI Vision Installation Kit to this machine from the OSIsoft customer portal. If you are not using an existing SQL Server installation, you will also need to download the Microsoft SQL Server installation kit from the Microsoft website. This video will assume we have already got a working SQL Server to use.

Next, we need to add server roles and features. Before you begin, verify that you are in the local administrator group on this machine with the **Computer Management** application.

Once you've verified that you have the appropriate permissions, launch **Microsoft Server Manager** and click **Add roles and features** and then click **Next**. Select the **Role-based or feature-based installation** option for the installation type and then click **Next**. Select the appropriate server from the **Server pool** and then click **Next**.

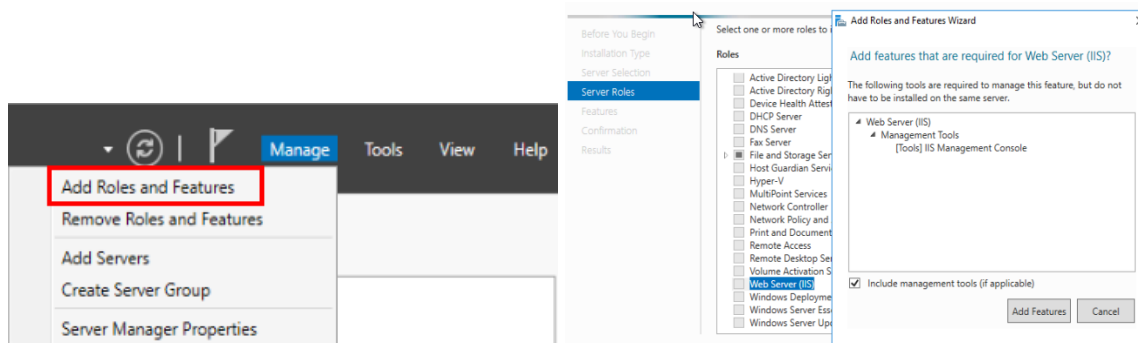
On the **Server Roles** page, select the roles appropriate for your operating system.

Operating system	Roles
Windows Server 2012 and Windows Server 2012 R2	Application Server and Web Server
Windows Server 2016 and Windows Server 2019	Web Server

For the installation on our machine which is running Windows Server 2016, we have selected the Web Server (IIS) option. PI Vision install kit requires **Web Server (IIS) role** to be installed prior the installation. Click **Add Features** and then click **Next**.

It is not necessary to add more features beside the default selection that includes management tools (IIS Management Console). PI Vision installation procedure triggers a script that installs all necessary features and role services for PI Vision.

The least minimum role services are listed in *PI Vision Installation and Administration Guide* in section “Prepare the PI Vision application server computer – Add server roles and features” or in [OSIsoft Live Library](#).



For installing the required and recommended roles and features:

- **On the Features page,**
 - o open the Windows Process Activation Service and then select the Process Model and Configuration APIs options. Click Next and then click Next again.
- **On the Role Services page,**
 - o under Common HTTP Features make sure that you have everything checked except WebDAV Publishing.
 - o Under Health and Diagnostics, there are no required settings, but we recommend adding HTTP Logging, Logging Tools, Request Monitor, and Tracing.
 - o All options under Performance are required.
 - o Under Security, Windows Authentication, Request Filtering, and URL Authorization are required, but we also recommend selecting IP and Domain Restrictions. We recommend using Windows Authentication, but if you need to use Basic Authentication, you can select that option.
 - o Under Application Development, .NET extensibility 4.5, 4.6, or 4.7 and ASP.NET 4.5, 4.6, or 4.7 are required. We also recommend selecting ISAPI extensions and ISAPI filters.
 - o Under Management Tools, IIS Management Console is required and we recommend adding IIS Management Scripts and Tools and Management Service as well.

Once you have made all of your selections, click **Next**. Then, click **Install** on the **Confirmation** page. Please note, this process will take some time. We have significantly increased the speed during this section (of the video).

If your installation was successful, you will see this note under the progress bar. Click the **Close** button.

Prepare SSL Access

Now that we have prepared the PI Vision Application Server, we need to configure Secure Socket Layer (or SSL) access. To fully secure access to PI Vision, use a digital certificate obtained from a trusted third-party registrar. Though the PI Vision installation can create a self-signed certificate, this certificate will not be trusted by browser clients and will result in certificate warnings when users visit PI Vision.

The Vision Install Kit will set up the site for SSL access, but we'll need to add our own certificate to replace the self-signed certificate after Vision is installed.

Keep in mind that this walk-through assumes you are installing IIS. That means that we are not running any other websites on this machine. Refer to the documentation if you are installing PI Vision on a webserver that already has existing websites.

Exercise

Test your knowledge by going through the steps for preparing an Application Server for the PI Vision installation. You can use the virtual environment provided with this part of the course or perform an installation on your own environment. The virtual environment is not identical to the one used in the videos. Differences will be pointed out in the exercises.

Tasks:

- Add the required Server Roles and Features. At this point you can limit this to the **Web Server (IIS)** role which is required prior to the PI Vision installation and continue the installation process with the default settings.
- Within the training environment we will use the self-signed certificate which will be generated during the PI Vision installation. For the purpose of this training, it is not necessary to obtain a digital certificate from a trusted third-party registrar as it is recommended.

Solution

Review the video for details.

Create a Service Account and Set Up Permissions

Video: [PI Vision 2020 Installation - Phase 2 - Create a Service Account and Set Up Permissions](#)

This video demonstrates the steps to verifying the permissions for the service account where you will install PI Vision 2020. It is divided into the following sections:

- **Check PI Data Archive & PI AF Server Permissions**

In Phase 2 of the PI Vision 2020 installation process, we need to create a service account and set up permissions. We strongly recommend that you create a custom service account for PI Vision. We worked with our IT team and they created a service account that we will use for PI Vision.

Check PI Data Archive & PI AF Server Permissions

We need to verify that we have the right permissions on our **PI Data Archive** and **AF Server** to allow this account to connect to them.

We have switched to our **PI Data Archive** machine to make sure that we have the right permissions.

Launch **PI System Management Tools**. You can do this from any machine with **PI System Management Tools** installed.

Click **Security** and then click **Identities, Users, & Groups**. Verify the existence your PI Vision identity. Click **Mappings & Trusts** and confirm that this service account is mapped to the PI Vision identity.

Click **Database Security**. Verify that the **PI Vision** identity has **read** access on **PI Mapping** and **PI Point**. For individual PI Points, we need to make sure that the PI Vision service account has **read** access on **Point and Data Security**. We'll perform a spot check on one of them to confirm that this was setup correctly, in this case, we'll use **SINUSOID**.

Click **Point Builder**. Click **Search** and then search for **SINUSOID**. Click **SINUSOID** from the search results and then click the **Security** tab. Here we can see the PI Vision identity has read access on **Point Security** and **Data Security**. This will need to be true for any PI Point that's viewed in PI Vision.

Note: The PI Vision Service account requires read access to all PI Points which should be available to view in PI Vision for performing searches and potentially calculations for AF Data References. Still, users will only be able to access data via PI Vision to which they have read access personally.

We need to confirm that we have **read** access in AF for the service account with **PI System Explorer**.

Click **File** and then click **Server Properties**. Click the **Mappings** tab and verify that we have a mapping for the PI Vision service account and that it receives an identity that we know has **read** and **read data** access to the AF Server, the AF Databases, the AF Elements, the AF Tables, and the Event Frames that we want to be viewed in PI Vision.

Exercise

Perform the steps to create a service account and set up permissions on the virtual environment. On the virtual environment you will need to create the account first and set the permissions as shown in the video. If you are unsure, have a look at the solution for guidance.

Tasks:

- Create a Service Account for PI Vision on the Domain Controller. OSIsoft recommends that you name the service account **PIVisionService**. Set a password for the account (for example: ABC123xyz) and note it down for later use.
- On the PI Data Archive machine, create a PI Vision identity and map the service account to this identity. Give the PI Vision identity read access to the tables PIMAPPING and PIPOINT. Since we only have demo Points on the system, we do not need to give read access to existing Points, however you can do this for SINUSOID for practice.
- Create an identity on the Asset Server and map the service account to this identity. We do not have any databases yet, so it is sufficient to give read access to the Asset Server in general.

Solution

Create a Service Account for PI Vision

1. On the domain controller, open Active Directory Users and Computers.
2. Right-click the Users folder, and then click New > User to open the New Object - User window.
3. Enter the name of your account and click Next.

You can enter Vision as the first name, Service as the last name, and PIVisionService as the user logon name.

The screenshot shows a 'New Object - User' dialog box. At the top, it says 'Create in: pischool.int/Users'. Below this, there are several input fields: 'First name' with 'Vision', 'Last name' with 'Service', and 'Full name' with 'Vision Service'. There is also an 'Initials' field which is empty. Under 'User logon name', there is a text box containing 'PIVisionService' and a dropdown menu showing '@pischool.int'. Below that, under 'User logon name (pre-Windows 2000)', there are two text boxes: the first contains 'PISCHOOL\' and the second contains 'PIVisionService'. At the bottom, there are three buttons: '< Back', 'Next >', and 'Cancel'. The 'Next >' button is highlighted with a blue border.

4. Enter the account password **ABC123xyz** and select *User cannot change password* and *Password never expires* check boxes.

Make a note of the account name and password as you will need it during installation. After installation, you will configure the PI Vision application pools and services to run under this new account.

New Object - User

Create in: pischool.int/Users

Password: [masked]

Confirm password: [masked]

User must change password at next logon

User cannot change password

Password never expires

Account is disabled

< Back Next > Cancel

5. Click Next and Finish.

Check PI Data Archive Permissions (back on PISRV01)

1. In System Management Tools create a new identity PIVision.

File View Tools Help

Servers

Search

Servers

- PISRV01

PI Identities | PI Users | PI Groups

Identity	Server	Collective	Description
PIEngineers	PISRV01		Any individual with enginee
PIOperators	PISRV01		Any individual with operatio
PISupervisors	PISRV01		Any individual with supervis
PIWorld	PISRV01		Built-in identity to represent

System Management Tools

Search

- > Alarms
- > Batch
- > Data
- > Interfaces
- > IT Points
- > Operation
- > Points
- ▼ Security
 - Database Security
 - Firewall
 - Identities, Users, & Groups**
 - Mappings & Trusts
 - Security Settings

New Identity ? X

Identity:

Server:

Description:

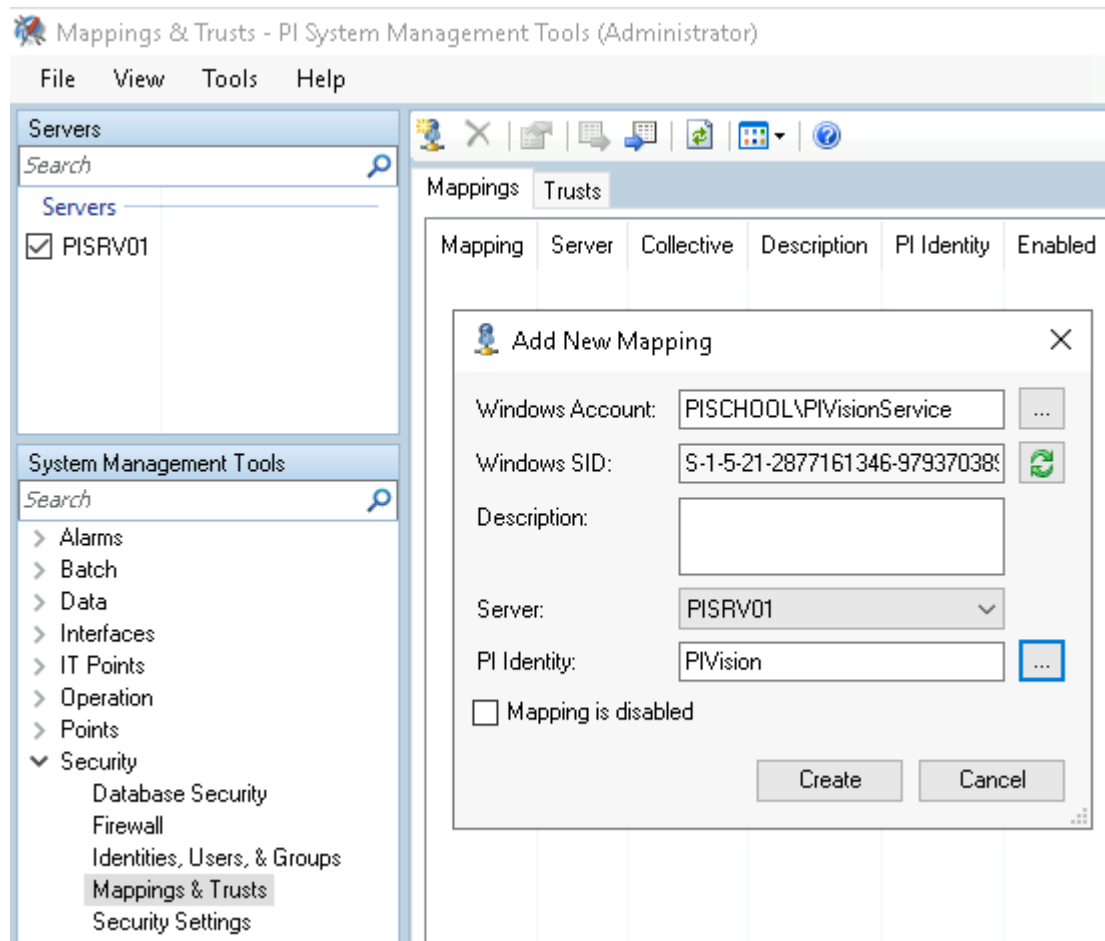
Identity cannot be deleted

Identity cannot be used in a Mapping

Identity cannot be used in a Trust

Identity is disabled

2. Create a new mapping to map the PIVisionService account to this new identity.



3. Give this identity read access to the PIMAPPING and PIPOINT tables.

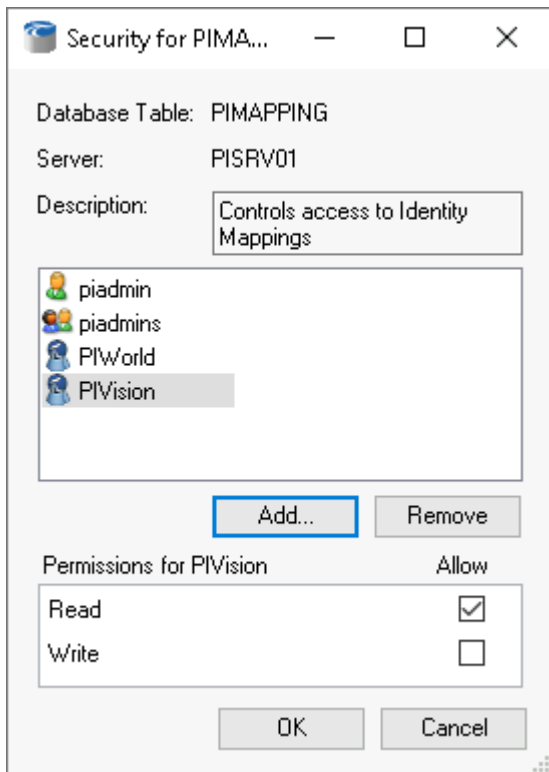
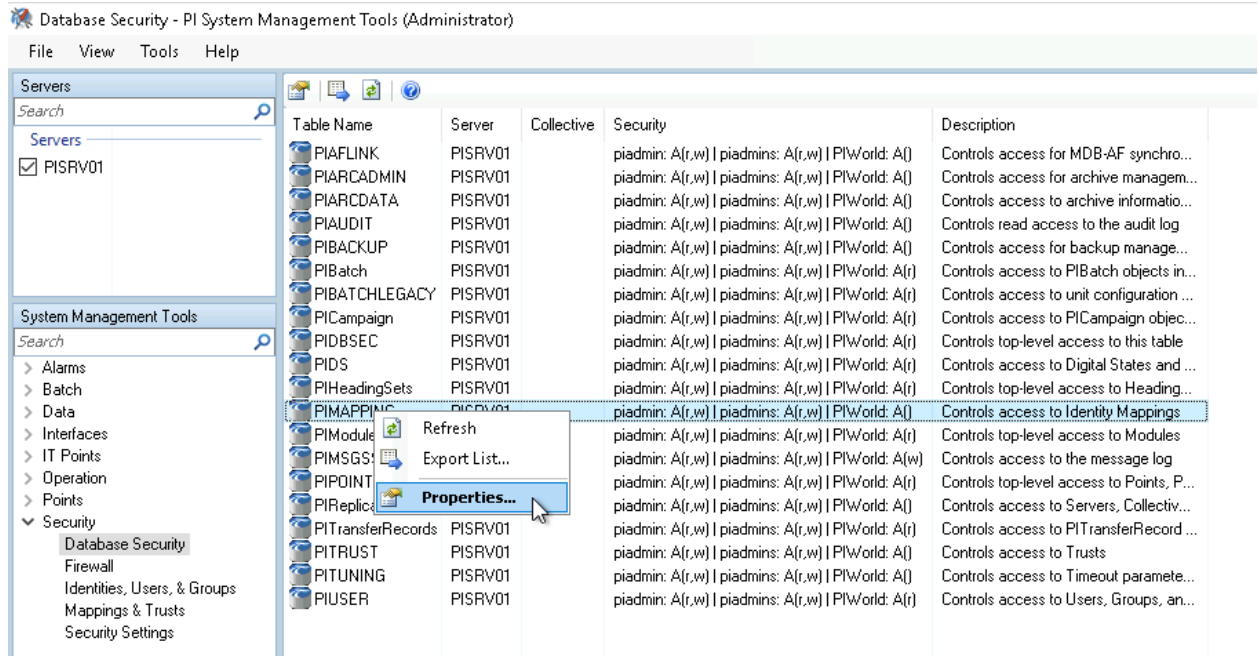
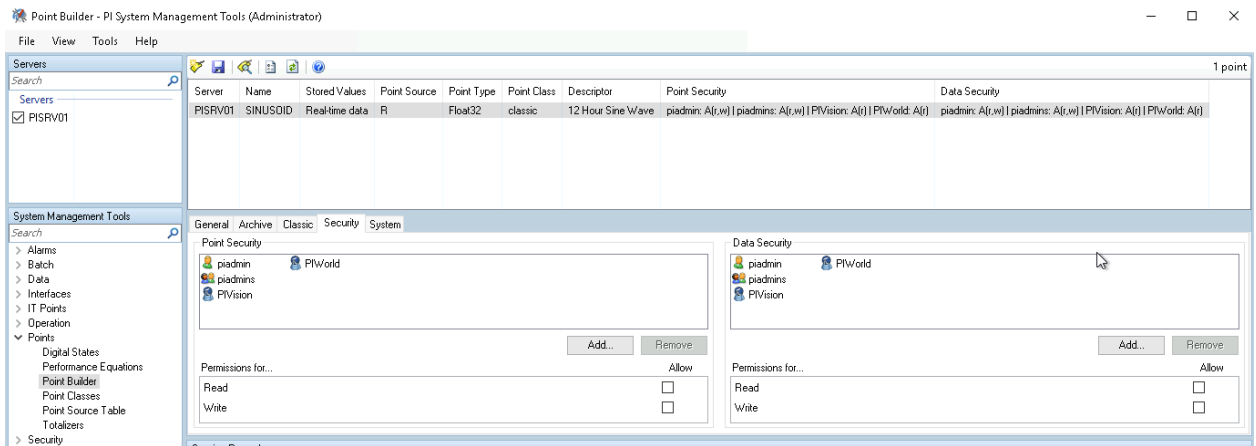


Table Name	Server	Collective	Security	Description
PIAFLINK	PISRV01		piadmin: A(r,w) piadmins: A(r,w) PIWorld: A()	Controls access for MDB-AF synchro...
PIARCADMIN	PISRV01		piadmin: A(r,w) piadmins: A(r,w) PIWorld: A()	Controls access for archive managem...
PIARCDATA	PISRV01		piadmin: A(r,w) piadmins: A(r,w) PIWorld: A()	Controls access to archive informatio...
PIAUDIT	PISRV01		piadmin: A(r,w) piadmins: A(r,w) PIWorld: A()	Controls read access to the audit log
PIBACKUP	PISRV01		piadmin: A(r,w) piadmins: A(r,w) PIWorld: A()	Controls access for backup manage...
PIBatch	PISRV01		piadmin: A(r,w) piadmins: A(r,w) PIWorld: A(r)	Controls access to PIBatch objects in...
PIBATCHLEGACY	PISRV01		piadmin: A(r,w) piadmins: A(r,w) PIWorld: A(r)	Controls access to unit configuration ...
PICampaign	PISRV01		piadmin: A(r,w) piadmins: A(r,w) PIWorld: A(r)	Controls access to PICampaign objec...
PIDBSEC	PISRV01		piadmin: A(r,w) piadmins: A(r,w) PIWorld: A(r)	Controls top-level access to this table
PIDS	PISRV01		piadmin: A(r,w) piadmins: A(r,w) PIWorld: A(r)	Controls access to Digital States and ...
PIHeadingSets	PISRV01		piadmin: A(r,w) piadmins: A(r,w) PIWorld: A(r)	Controls top-level access to Heading...
PIMAPPING	PISRV01		piadmin: A(r,w) piadmins: A(r,w) PIVision: A(r) PIWorld: A()	Controls access to Identity Mappings
PIModules	PISRV01		piadmin: A(r,w) piadmins: A(r,w) PIWorld: A(r)	Controls top-level access to Modules
PIMSGSS	PISRV01		piadmin: A(r,w) piadmins: A(r,w) PIWorld: A(w)	Controls access to the message log
PIPOINT	PISRV01		piadmin: A(r,w) piadmins: A(r,w) PIVision: A(r) PIWorld: A(r)	Controls top-level access to Points, P...
PIReplication	PISRV01		piadmin: A(r,w) piadmins: A(r,w) PIWorld: A()	Controls access to Servers, Collectiv...
PITransferRecords	PISRV01		piadmin: A(r,w) piadmins: A(r,w) PIWorld: A(r)	Controls access to PITransferRecord ...
PITRUST	PISRV01		piadmin: A(r,w) piadmins: A(r,w) PIWorld: A()	Controls access to Trusts
PITUNING	PISRV01		piadmin: A(r,w) piadmins: A(r,w) PIWorld: A()	Controls access to Timeout paramete...
PIUSER	PISRV01		piadmin: A(r,w) piadmins: A(r,w) PIWorld: A(r)	Controls access to Users, Groups, an...

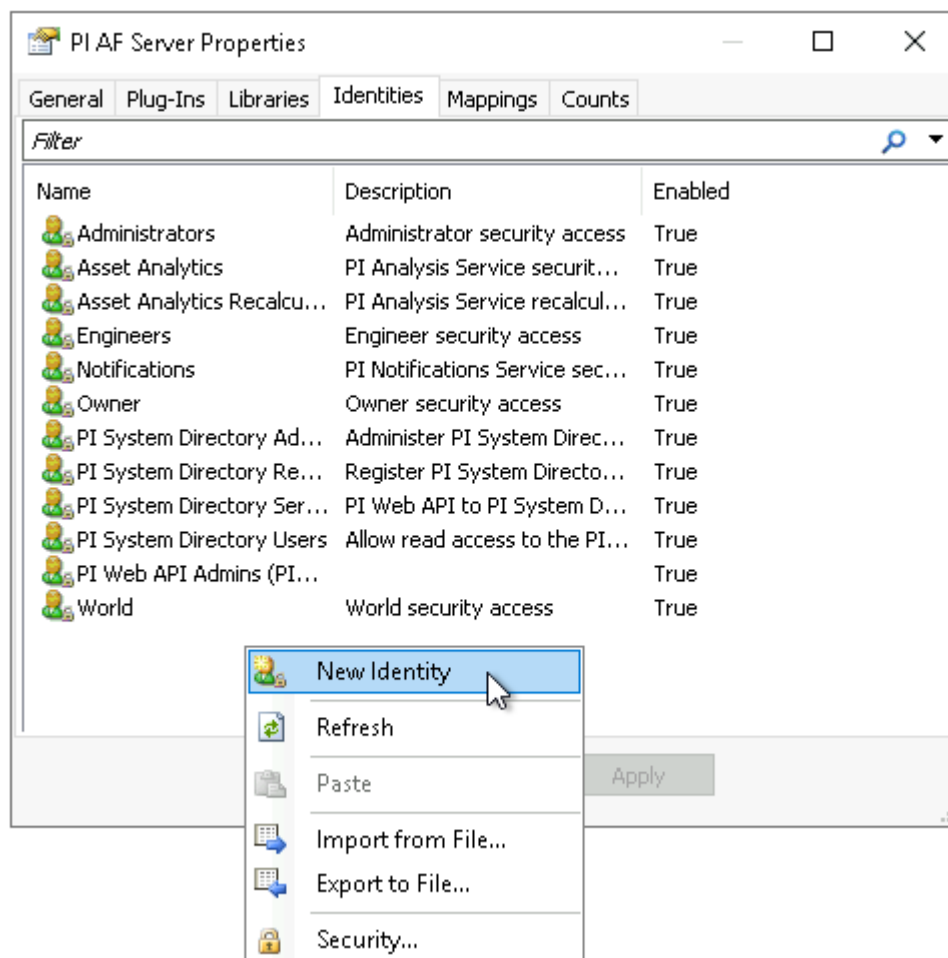
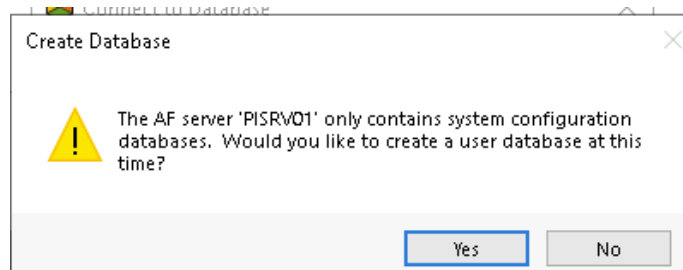
- For each PI Point which should be accessible through PI Vision we need to grant read access. On the training system we can do this exemplarily for SINUSOID as we do not yet have any production points we need to expose. Since we have included the identity with read access on the PIPOINT table, the identity will be added with read access to newly created Points by default.

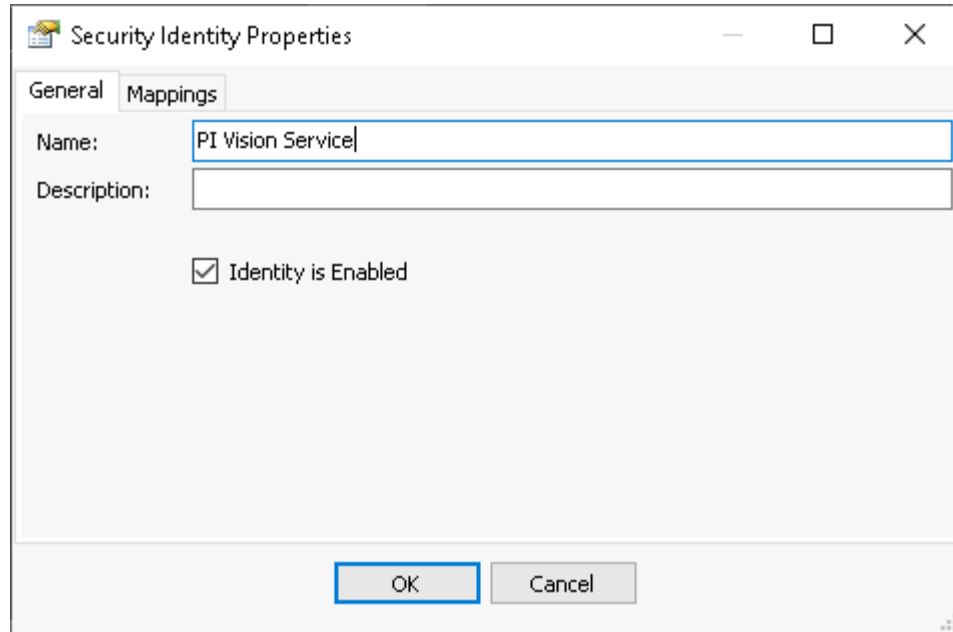


Check PI AF Server Permissions

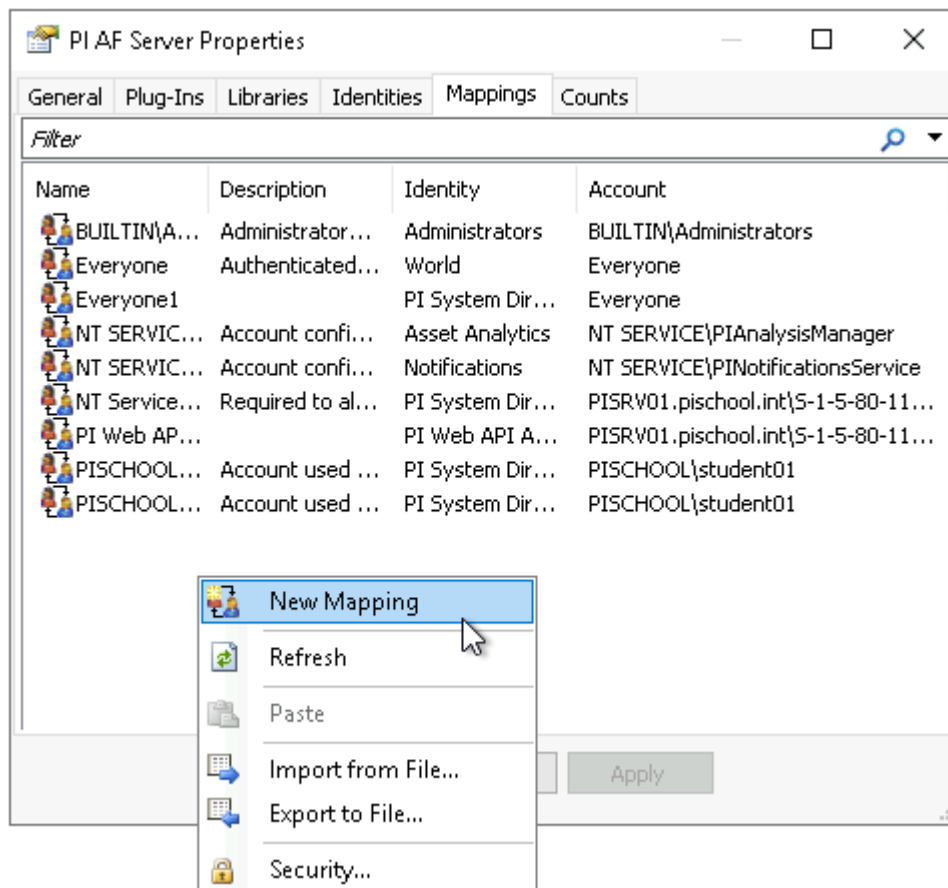
1. On the training system, we do not yet have any AF databases we need to expose in PI Vision. To grant the identity general rights to AF open PI System Explorer and go to File > Server Properties > Identities... (or File > Connections..., select the AF server and click Properties) to open the PI AF Server Properties dialog. Add a new identity *PI Vision Service*.

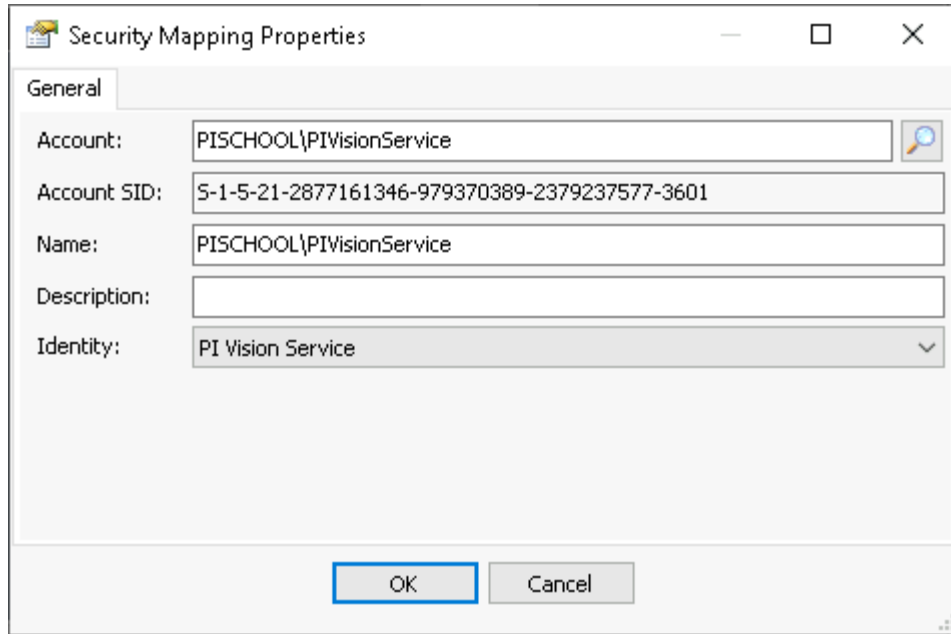
Note: A message will display to create a new database, you can respond 'No'.



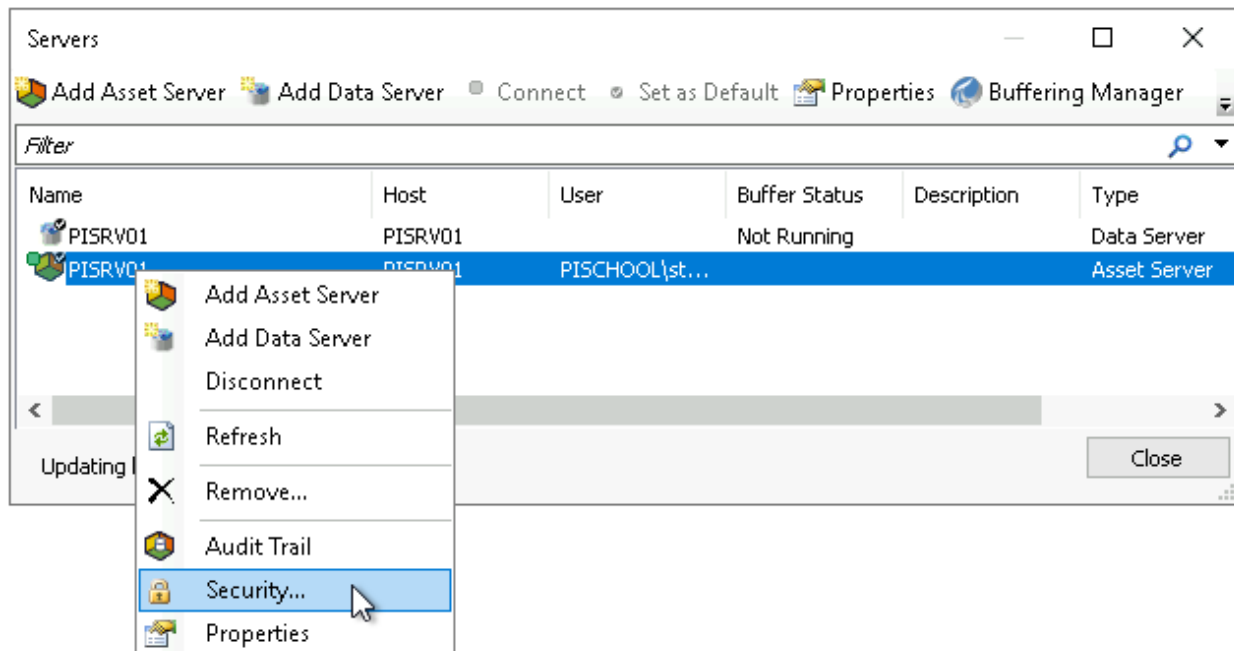


2. Under the Mappings tab create a new mapping and map the identity to the account PISCHOOL\PIVisionService.

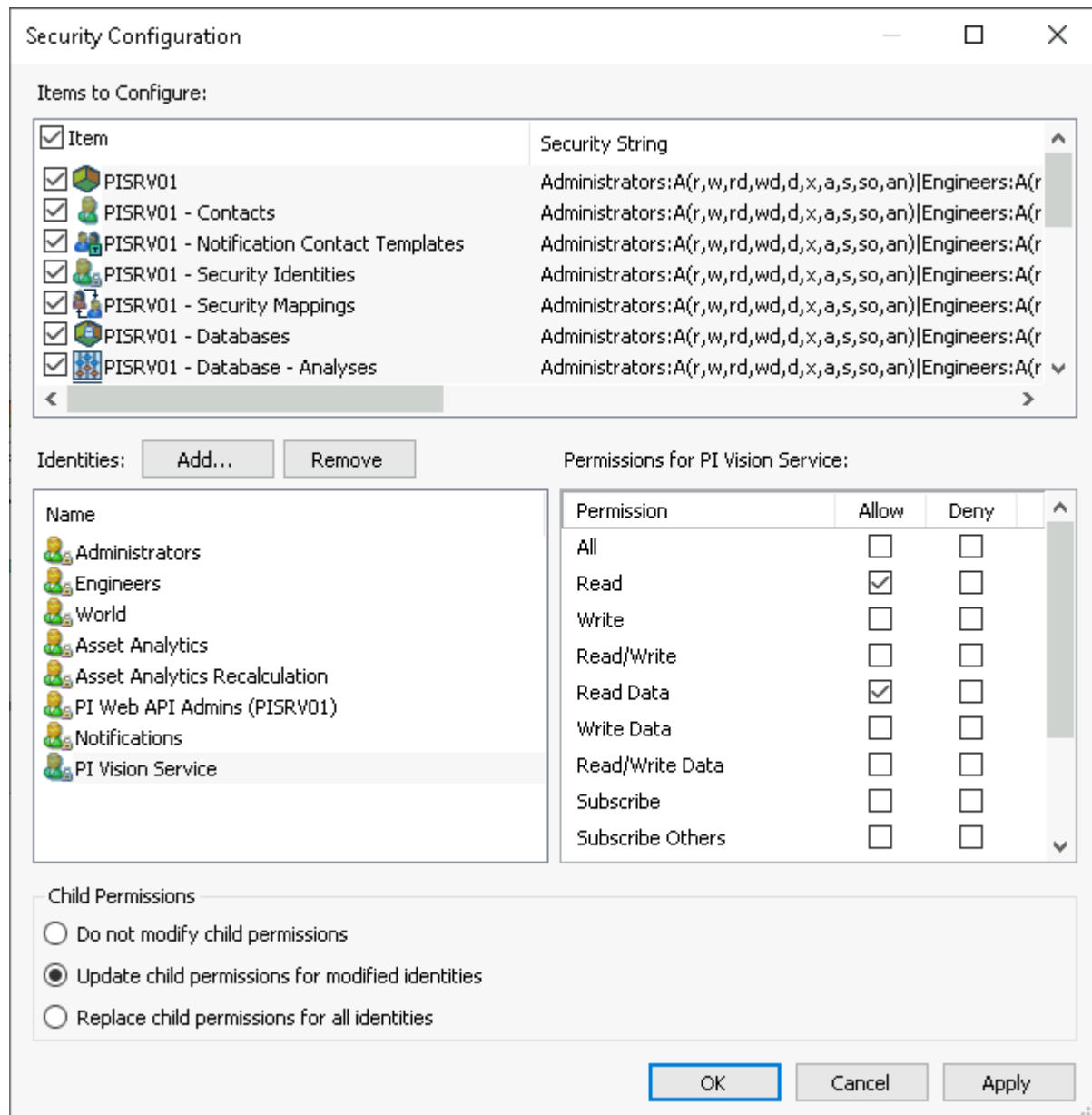




3. To set the permissions for the new identity open File > Connections... (if you don't have it open already from the previous steps), and open the security settings for the Asset Server.



4. Add the new identity and give it read access.



The Installation Process

Run the Installation Process

Video: [PI Vision 2020 Installation - Phase 3 - Run the Installation Process](#)

This video demonstrates the steps to install and run PI Vision 2020. It is divided into the following sections:

- Run the PI Vision 2020 Install Kit
- Check the PI Vision Application Pool Configurations
- Select a Different Certificate to Use for the PI Vision Web Site

Run the PI Vision 2020 Install Kit

Navigate to the location on your computer where you have the PI Vision Install Kit downloaded.

Remember, before you install PI Vision here, you need to run the installation as an account that is in the local administrator's group.

Right click the install file and then click **Run as administrator**. Extract the files to a location of your choosing. When this process is complete, you will see a list of the components that will be installed. Notice that one of the components is Microsoft.NET Framework 4.8. This will likely require a restart of the machine. Click **OK** to continue. When the .NET Framework install is complete, click **Finish**, then click **Restart Now** to reboot your machine.

After the machine reboots, the installation process will continue, running services will need to be stop, click **Next**. A series of processes contain files that need to be closed, select automatically close application and click **Next**. (you may be requested to enter the **Default Asset server** and **Default Data server** in the prompts and click **Next**. You can specify a custom location for the PIHOME Installation directories or keep the default C Drive location.)

The installation process will continue. Next, we will begin the **PI AF Client 2018 SP3 Patch 3** installation. Click **Next**. Decide whether you want to participate in our customer experience improvement program and then click **Next**. You can optionally enable the **Management** plug-in feature by clicking here. Click **Next** to continue.

If you do not have Microsoft Excel installed on this machine, you will see a message here to let you know that PI Builder will not be installed since Excel is not available.

Click **Install**.

The final part of the install is the **PI Vision Installation Wizard**. Click **Next**. Click **Continue** to acknowledge that you will comply with the laws, rules, and regulations for cookies. The next part of the process checks for any missing required Windows features. Leave the **Install missing Windows features now** option checked. Click **Continue**. In the **Install Required Windows** Feature pop-up, click **OK**.

Again, decide whether you want to participate in our customer experience improvement program and then click **Next**. Click **Next** again. Since we just installed the web server, we only have the default website listed here.

If you had an existing web server, you would select your website here if you were not using the default website. Click **Next** and then click **Install**. After the process completes, click **Finish**. Then, after the services start, click **Next**. Our machine now requires a reboot so we will click **Yes** to restart the machine now.




Once the machine has been rebooted, you can see that the PI Vision 2020 setup was successful. Click **Close**. Close Server Manager. PI Vision 2020 is now installed.

Check the PI Vision Application Pool Configurations

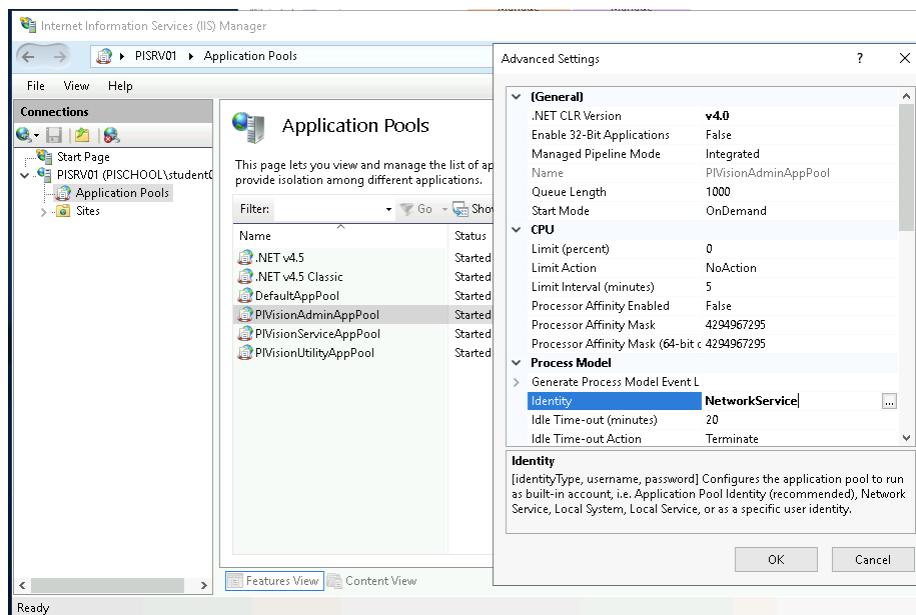
An IIS application pool is a pool - i.e., a collection - that houses applications on IIS. Each application pool consists of a process called **w3wp.exe** that runs on the server machine.

PI Vision installation creates three application pools:

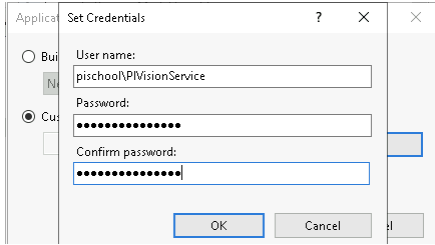
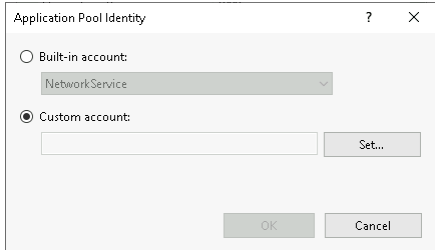
- *PIVisionAdminAppPool* runs the Administration website
- *PIVisionServiceAppPool* runs the main PI Vision application website
- *PIVisionUtilityAppPool* runs the PI Vision Display Utility.

 PIVisionAdminAppPool	Started	v4.0	Integrated
 PIVisionServiceAppPool	Started	v4.0	Integrated
 PIVisionUtilityAppPool	Started	v4.0	Integrated

We need to make sure that the PI Vision application pools are running under the correct account in the **Internet Information Services Manager**. In the IIS Manager, Click the webserver and then click **Applications Pools**. Here, we can see the admin, service, and utility application pools. Right click one and then click **Advanced Settings** to change their identity. Scroll to the **Identity** setting, double click it, select **Custom account**, click **Set**, enter your username and password, click **OK** and then click **OK** again.



The screenshot shows the Internet Information Services (IIS) Manager interface. The left pane displays the 'Application Pools' folder under the 'PISRV01' server. The main pane shows a list of application pools, including PIVisionAdminAppPool, PIVisionServiceAppPool, and PIVisionUtilityAppPool, all with a status of 'Started'. The right pane shows the 'Advanced Settings' dialog for the selected PIVisionAdminAppPool. The 'Identity' setting is highlighted, and the 'NetworkService' account is selected. The 'Process Model' section shows 'Managed Pipeline Mode' set to 'Integrated' and 'Start Mode' set to 'OnDemand'.



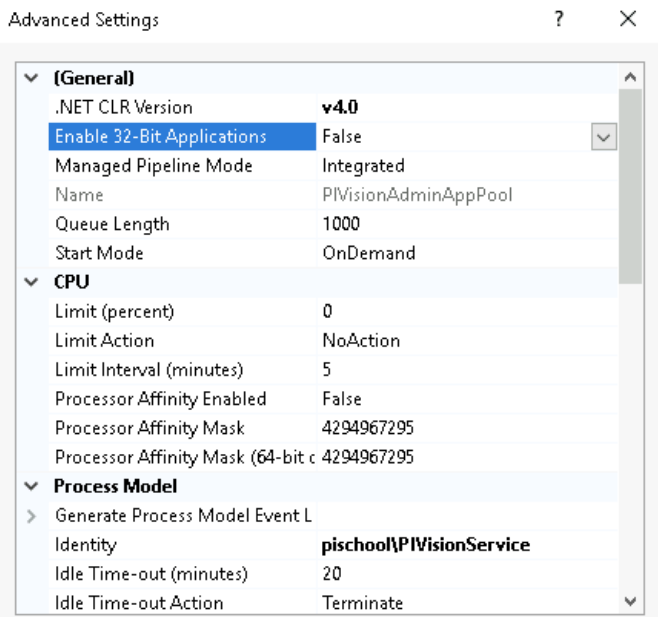
Application Pools

This page lets you view and manage the list of application pools on the server. Application pools are associated with web applications and provide isolation among different applications.

Filter: [dropdown] Go [dropdown] Show All [dropdown] Group by: No Grouping [dropdown]

Name	Status	.NET CLR V...	Managed Pipel...	Identity
.NET v4.5	Started	v4.0	Integrated	ApplicationPoolIdentity
.NET v4.5 Classic	Started	v4.0	Classic	ApplicationPoolIdentity
DefaultAppPool	Started	v4.0	Integrated	ApplicationPoolIdentity
PIVisionAdminAppPool	Started	v4.0	Integrated	pischool\PIVisionService
PIVisionServiceAppPool	Started	v4.0	Integrated	pischool\PIVisionService
PIVisionUtilityAppPool	Started	v4.0	Integrated	pischool\PIVisionService

Verify that **Enable 32-Bit Applications** is **false** (default setting). Click **OK**. Repeat these steps for the remaining app pools.



When you're finished, your app pools are running under the custom domain account.

Select a Different Certificate to Use for the PI Vision Web Site

Within **IIS Manager**, click the **web server** and then click **Sites** to display the list of web sites on your machine's IIS server. Locate the site that has the **PI Vision** application installed under it. By default, and in our case, this is **Default Web Site**.

Click **Bindings**. In the **Site Bindings** dialog box, click the **https** row and then click **Edit**. In the **Edit Site Bindings** dialog box, click the drop-down list below **SSL certificate** and then select a different certificate which will be bound to the port selected in this binding for your IIS Website.

The certificate we selected is trusted by browser clients and will prevent certificate warnings from occurring when users visit PI Vision. Click **OK**.

We have now verified that we have the right permissions and certificate and we have successfully installed PI Vision on this machine. From here, you will finish configuring PI Vision.

Exercise

Perform the steps to run the installation process on the virtual environment. You will need to make some adaptations to the setup at hand compared to the video. If you are unsure, have a look at the solution for guidance.

Tasks:

- Run the PI Vision 2020 Install Kit (PI-Vision_2020_). A shortcut to the folder PI Vision Install Kits can be found on the desktop.
- Optional: Run the install kit for PI Vision 2020 Patch 1 (PI-Vision_2020-Patch-1_) which is also available on the training environment.
- Check the PI Vision Application Pool Configurations

Note: Within the training environment we will use the self-signed certificate.

Solution

Run the PI Vision 2020 Install Kit:

Follow the installation process with the default settings as shown in the video. You might need to re-start the installation process manually after reboot. On the virtual environment it is not necessary to enter the default servers as they are already set for the machine.

Note: If you have not installed the required and recommended roles and features previously the installation of required Windows Features will take several minutes.

Check the PI Vision Application Pool Configurations:

Change the identity for the three application pools to PIVisionService (password: ABC123xyz).

Post-Installation Tasks

Configure PI Vision

Video: [PI Vision 2020 Installation - Phase 4 - Configure PI Vision](#)

Introduction

This video demonstrates the steps to configure PI Vision 2020 after installation. It is divided into the following sections:

1. Add a PI Data Archive Server or a PI AF Server to the Registered Servers List
2. Manage PI Vision Local User Groups
3. Check SQL Server Permissions
4. Create the PI Vision Database
5. Allow Access to Each PI Data Archive Server and PI AF Server from PI Vision
6. Configure PI ProcessBook Import Folders

Part 1: Add a PI Data Archive Server or a PI AF Server to the Registered Servers List

Before going to the PI Vision Admin site, there are a couple of things that we want to check. First, we want to make sure that the PI Data Archives and AF Servers that we want to connect to in PI Vision are listed in our known servers table.

On the PI Vision web server, open **PI System Explorer** and click **File** then click **Connections**, I'm going to confirm that I can connect to my Data Archive by selecting the server and clicking **Connect**. To add additional AF servers, click **Add Asset Server**, enter the name of the AF Server in the Host field, click **Connect** and **OK**. Similarly, to add PI Data Archives, click **Add Data Server**, enter the name of the PI Data Archive in the **Host** field, click **Connect** and **OK**.

Part 2: Manage PI Vision Local User Groups

Next, there are three local user groups that were created when PI Vision was installed. These groups control who has access to different PI Vision components. Open **Computer Management**, expand **Local Users and Groups** under **System Tools**, and select **Groups**. The **PI Vision Admins**, **PI Vision Users** and **PI Vision Utility Users** groups were all created when PI Vision was installed.

The **PI Vision Admins** group controls access to the PI Vision Admin site and by default contains the user who installed PI Vision.

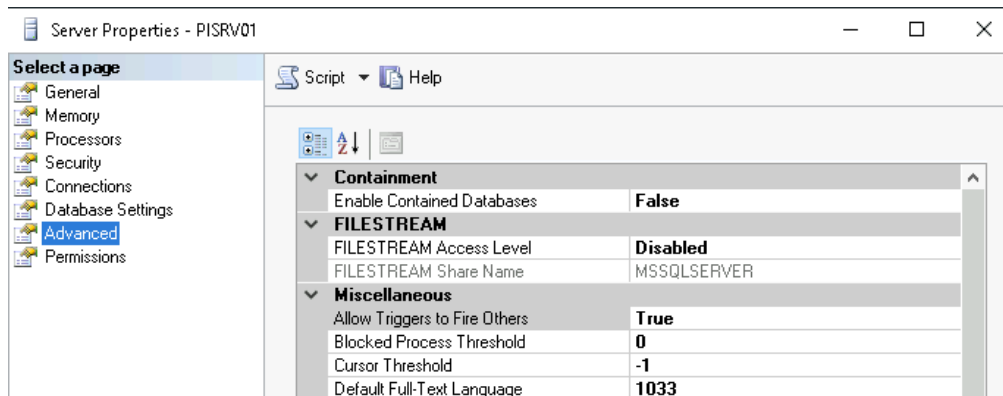
The **PI Vision Users** group controls access to the PI Vision site and by default contains authenticated users.

The **PI Vision Utility Users** group controls access to use the **PI Vision Display Utility**, which is installed with PI Vision, or the **PI ProcessBook to PI Vision Migration Utility**, which is a separate installation. By default, this group also contains the user who installed PI Vision.

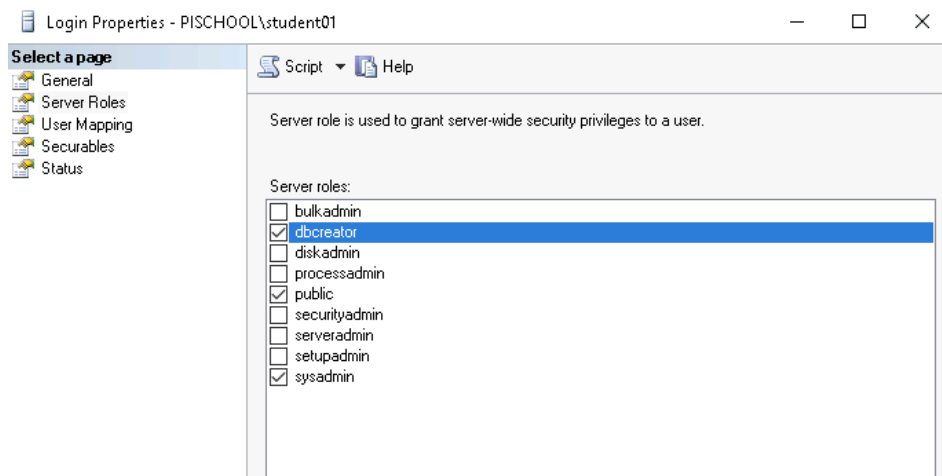
To add domain users or groups to a PI Vision local group, double click the group, click **Add**, enter the name of the domain user or group account, click **Check Names**, then click **OK** and **Apply**. To remove existing users or groups from a PI Vision local group, double click the group, select an existing member, click **Remove**, and **Apply**. Be sure to update all of these PI Vision local groups with your necessary domain users and groups.

Part 3: Check SQL Server Permissions

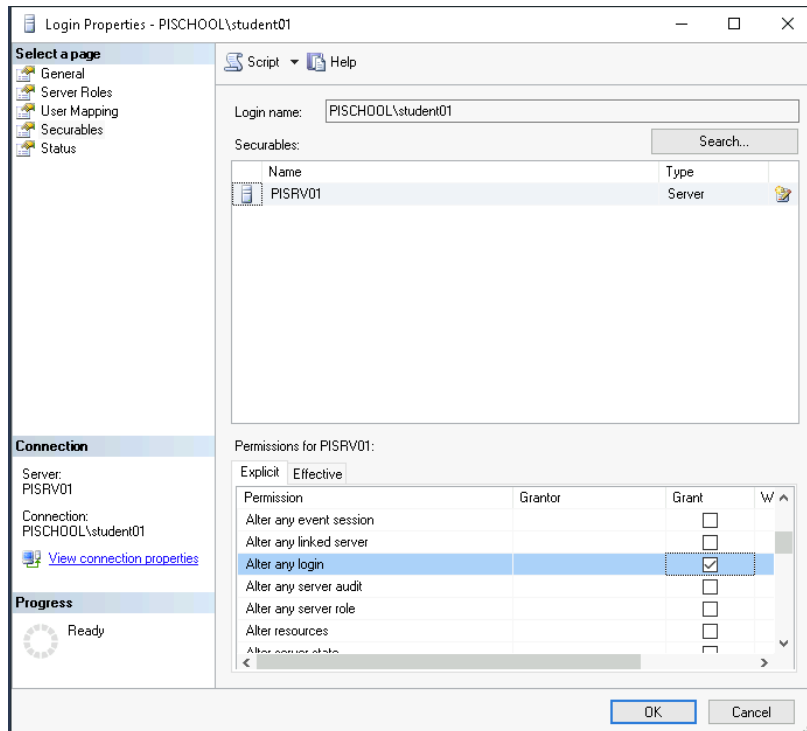
Next, we will check the SQL permissions before attempting to create the PI Vision SQL Database automatically. On the SQL Server, open **SQL Server Management Studio** and connect to the SQL Server instance. Note the SQL Server instance name, which will be needed for the PI Vision Admin site. The full name will be located at the top of the **Object Explorer** pane, and it might end with SQLExpress. Next, verify that this SQL Server has **Allow Triggers to Fire Others** set to true. To check this right click the SQL instance and go to **Properties**. Under **Advanced** confirm that **Allow Triggers to Fire Others** (under Miscellaneous) is set to true.



Additionally, the user accessing the PI Vision Admin site must have specific permissions on the SQL Server to be able to create the PI Vision SQL database. Expand **Security, Logins**, right click the user account and select **Properties**. Click **Server Roles** and confirm that the **dbcreator** server role is selected.



ALTER ANY LOGIN permission is also required which is given to users who have the **securityadmin** server role.



Part 4: Create the PI Vision Database

After verifying that my user account is in the **PI Vision Admins** group and has the appropriate permissions on the SQL Server, we will navigate to the PI Vision Admin site on the PI Vision web server. Right-click the web browser and select **Run as Administrator**. Then enter the PI Vision Admin site URL. By default, the PI Vision Admin site will be located at **https://webserver/PIVision/Admin** where **webserver** is the name of the PI Vision web server. Alternatively, open **IIS Manager**, expand **Sites**, the site where PI Vision is installed (in my case **Default Web Site**), **PIVision** and select **Admin**. In the Actions pane, click **Browse *:443 (https)**. Note that navigating to the PI Vision Admin site via IIS Manager will use localhost in the URL, which might not be included in the certificate Subject Alternative Name.

PI Vision uses two websites:

- The administration website used for initial configuration and maintenance:
 - <https://<WebServer>/PIVision/Admin>
- The main application website for creating and visualizing displays:
 - <https://<WebServer>/PIVision>

<WebServer> is the hostname or FQDN of the PI Vision IIS Application Server where Microsoft Internet Information Services (**IIS**) server role is installed.

In the Overview page of the PI Vision Admin site, click **Manage Configuration** next to PI Vision Database. In the **SQL Server** field, use the dropdown or manually enter the name of the SQL Server instance to host the PI Vision SQL Database which was found in **SQL Server Management Studio**. In the **Database** field, enter the name of the PI Vision SQL Database to be created on the SQL Server. Click **Save** to create the PI Vision SQL Database and verify green checkmarks appear next to the fields. If you are not able to create the PI Vision SQL Database using the PI Vision Admin site, you may create the PI Vision SQL Database manually, please see the **Run the go.bat script to configure the PI Vision database** section of the PI Vision Installation and Administration Guide for details.

Part 5: Allow Access to Each PI Data Archive Server and PI AF Server from PI Vision

The next step in the PI Vision Admin site is to add the Data Archives and AF Servers that we want to be exposed in PI Vision. In the PI Vision Admin **Configuration** page, click the **Data Servers** tab. Here the Data Archives from the Known Servers Table on the PI Vision web server are shown. To verify connectivity to a Data Archive, click **Test Connection** and make sure a green check appears in the status. Select the **Allowed** checkbox next to each Data Archive to be used in PI Vision and click **Save**.

Next, click the **Asset Servers** tab in the PI Vision Admin Configuration page. To verify connectivity to an AF Server, click **Test Connection** and verify a green check appears in the connection status. Select the check box next to each AF Database to be used in PI Vision or select the All check box to allow access to all databases for each AF Server. Click **Save** when finished.

Click **Overview** to go back to the PI Vision Admin overview page, and verify green checks appear next to the PI Vision SQL Database, each Data Archive server, and each AF Server.

Part 6: Configure PI ProcessBook import folders

The last configuration item to set up in the PI Vision Admin site is PI ProcessBook import folders. Click Import Folder Management. Here we can set up specific folders and the PI ProcessBook displays that are added to that folder will get picked up and be available to view in PI Vision. Make sure the PI Vision application pool account has read access to any folder and its subfolders to be added in this page. To add a PI ProcessBook import folder, enter the folder path in the **Folder** field and optionally an alias in the **Friendly Name** field. Click **Add**. Refresh the page and verify a green check appears in the **Folder Accessible** column.

Conclusion

We have now created the PI Vision SQL Database and managed the PI Vision local groups, in addition to configuring Data Archive, AF Server, and PI ProcessBook import folder access using the PI Vision Admin site. In the next video, we will configure Kerberos delegation to allow users to access Data Archives and AF Servers using Windows Integrated Security.

Exercise

Perform the steps to configure PI Vision on the virtual environment. You will need to make some adaptations to the setup at hand compared to the video. If you are unsure, have a look at the solution for guidance.




Tasks:

- Manage PI Vision Local User Groups. Add Domain Admins to the group PI Vision Admins and Domain Users to the group PI Vision Users.
- Check SQL Server Permissions
- Create the PI Vision Database
- Allow Access to PI Servers from PI Vision
- Add a PI ProcessBook Import Folder (C:/ProcessBook Displays)

Solution

Manage PI Vision Local User Groups

PI Vision installation creates three local groups on PI Vision IIS Application Server:

 PI Vision Admins	PI Vision Administrators
 PI Vision Users	PI Vision Users
 PI Vision Utility Users	PI Vision Utility Users

- *PI Vision Admins*: Members of this group are granted access to the PI Vision Administration website <https://<WebServer>/PIVision/Admin>.
 - ➔ **Add Domain Admins** as shown in the video.
- *PI Vision Users*: Members of this group are granted access to the main PI Vision application website <https://<WebServer>/PIVision>.
 - ➔ **Add Domain Users** and remove any other users as shown in the video.
- *PI Vision Utility Users*: Members of this group are granted permission to use PI Vision Display Utility to migrate PI Vision displays from one server to another or change PI Server as data source.
 - ➔ We do not need to change the members to this group for the purpose of this training.

Check SQL Server Permissions

You can confirm that **Allow Triggers to Fire Others** is set to true.
Add dbcreator and securityadmin Server Roles for student01.

Create the PI Vision Database

On the virtual environment navigate to <https://PISRV01/PIVision/Admin>.

Browser address bar: <https://pisrv01/PIVision/Admin/Configuration/#coreConfig>

Configuration

PI Vision Administration

- Overview
- Configuration**
- User Access Levels
- Display Management
- User Settings
- Reports
- Import Folder Management

Configuration

Data Servers **Asset Servers** **PI Vision Database**

SQL Server PISRV01

Database PIVision

Save

Changes take effect when you click Save

Allow Access to PI Servers from PI Vision

On the Data Servers tab: Test Connection and check Allowed for PISRV01.

PI Vision Administration PISCHOOLstudent01

- Overview
- Configuration**
- User Access Levels
- Display Management
- User Settings
- Reports
- Import Folder Management

Configuration

Data Servers Asset Servers PI Vision Database

Data Servers

Allow PI Vision to access a given Data Server.
Connecting to Data Servers as PISCHOOLPIVisionService

Status	Server	Version	Role	Connecting As	PI User	Allowed
<input checked="" type="checkbox"/>	PISRV01	3.4.420.1162	Application Pool	PISCHOOLPIVisionService	PIVision PIWorld	<input type="button" value="Test Connection"/> <input checked="" type="checkbox"/> Allowed
			Current User	PISCHOOLstudent01	piadmin	

Save

On the Asset Servers tab: Check All for PISRV01.

PI Vision Administration PISCHOOLstudent01

- Overview
- Configuration**
- User Access Levels
- Display Management
- User Settings
- Reports
- Import Folder Management

Configuration

Data Servers **Asset Servers** PI Vision Database

Asset Servers

Click the triangle (▾) next to the Asset Server name to see available databases for each Asset Server
Connecting to Asset Servers as PISCHOOLPIVisionService

Connection Status	Name	Databases	Version
<input checked="" type="checkbox"/> Test Connection	PISRV01	<input checked="" type="checkbox"/> All <input checked="" type="checkbox"/> PI System Directory	2.10.0.8628

Save

Add a PI ProcessBook Import Folder

Navigate to Import Folder Management and add the folder C:\ProcessBook Displays. Set a Friendly Name, for example ProcessBook Displays.

Optional: How Kerberos Delegation works

Kerberos delegation is a network authentication protocol that allows users in a distributed application environment to securely access remote data sources. Kerberos delegation is designed to provide strong authentication for client/server applications by using secret key cryptography. Clients obtain tickets from the Kerberos Key Distribution Center on Domain Controller and provide these tickets to servers when connections are established.

Kerberos Double Hop

Simply speaking, to view data from PI Data Archive and PI AF in PI Vision, client's (user's) account must authenticate not only to PI Vision IIS Application Server, but also to PI Data Archive and PI AF. PI Vision IIS Application server needs to forward (delegate) client's credentials to PI Data Archive and PI AF for authentication. This is called a **Double Hop** scenario.

Kerberos Double Hop is a term used to describe our method of maintaining the client's Kerberos authentication credentials over two or more connections. In this fashion we can retain the user's credentials and act on behalf of the user in further connections to other servers.

It works in 5 steps:

Step 1 – Client provides credentials to domain controller and it returns a Kerberos ticket to the client.

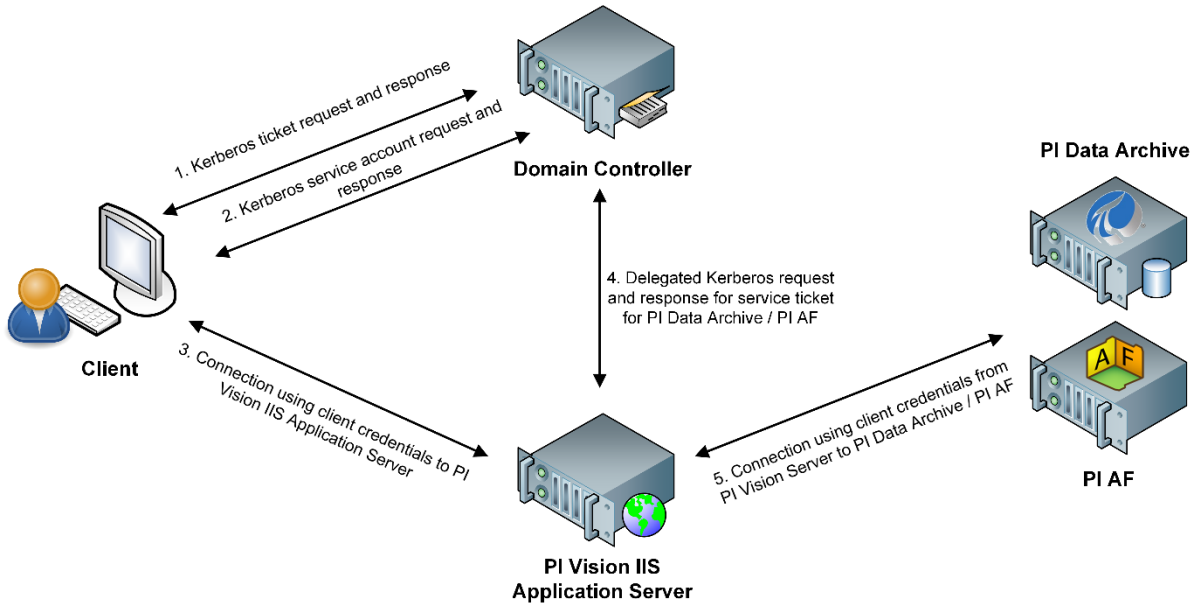
Kerberos ticket confirms the client credentials are validated and client is authorized to receive a service ticket. Service ticket provides access to application services.

Step 2 – Client uses the Kerberos ticket to request a service ticket from domain controller to connect to PI Vision IIS Application Server.

Step 3 – Client connects to PI Vision IIS Application Server and provides both Kerberos and service tickets.

Step 4 – PI Vision IIS Application Server uses the client's Kerberos ticket to request a service ticket, so PI Vision IIS Application Server can connect to PI Data Archive / PI AF.

Step 5 – PI Vision IIS Application Server connects to PI Data Archive / PI AF using the client's credentials.



Kerberos Delegation Types

There are four types of Kerberos delegation:

- Unconstrained Delegation (not recommended)
- Constrained Delegation – Kerberos Only
- Constrained Delegation – Any Authentication Protocol
- Resource-Based Constrained Delegation

Constrained delegation is more secure because it limits delegation to a specified list of services, rather than allowing delegation to any service as in **unconstrained delegation**. It requires additional configuration compared with unconstrained delegation. **Service Principal Names** must be setup for accounts the services are running under.

Kerberos only means there is no protocol transition to a non-Kerberos authentication method.

Any Authentication Protocol allows protocol transition if Kerberos authentication fails.

These types of delegation are configured for the service that delegates to other services. In our case, PI Vision service (*PIVisionServiceAppPool*) delegates to *PI Network Manager* service of PI Data Archive and *PI AF Application Service*.

Setting up the delegation requires access to the Active Directory Users and Computers on the Domain Controller and Domain Admin privileges.

Setting up Kerberos delegation is described in *PI Vision Installation and Administration Guide* in chapter “Enable Kerberos delegation using a custom PI Vision service account” or in [OSIsoft Live Library](#).

Resource-based Constrained Delegation (RBCD) introduced with Windows Server 2012 on the other hand has several benefits from the previous types:

- Is configured for the account of the resource service (*PI Network Manager, PI AF Application Service*) instead of the account of the service that delegates (*PIVisionServiceAppPool*).
- Domain Admin privileges are not required.
- Functions across domain and forest boundaries.

Therefore, RBCD is highly recommended type of delegation to set up.

RBCD configuration can only be done via *PowerShell*. To setup the delegation for the account of the service we need to delegate to *-PrincipalsAllowedToDelegateToAccount* parameter is used.

Setting up RBCD is described in *PI Vision Installation and Administration Guide* in chapter “Configure resource-based constrained delegation” or in [OSIsoft Live Library](#).

[How do I set up Kerberos delegation for PI Vision?](#) summarizes the links to the documentation explaining how the various delegation types are set up.

Service Principal Name

A service principal name (**SPN**) is a **unique identifier** of a service instance. SPNs are used by Kerberos authentication to associate a service instance with a service logon account. This allows a client application to request that the service authenticate an account even if the client does not have the account name. Without the SPN the client cannot receive the Service ticket and Kerberos delegation is not possible.

To configure delegation for PI Vision the SPNs must be registered for these services:

- *PI Network Manager* for PI Data Archive
- *PI AF Application Service* for PI AF
- IIS *PIVisionServiceAppPool, PIVisionAdminAppPool, PIVisionUtilityAppPool* application pools for PI Vision

The SPN name format for host-based service is composed of two elements:

<service class>/<host>

<service class>: A string that identifies the general class of the service. For example, “SqlServer”. In general, this can be any string that is unique to the service class. Be aware that the SPN syntax uses a forward slash (/).

- **PIServer** is service class of PI Network Manager service of PI Data Archive
- **AFServer** is service class of PI AF Application Service
- **HTTP** is service class for web applications using HTTP or HTTPS protocol such as PI Vision

<host>: The name of the computer on which the service is running. It can be FQDN or hostname.

SPN can be registered from any machine which is a member of the domain by user with appropriate permissions (such as Domain Admin or any user who was granted permissions)

To register an SNP use command line tool SETSPN in elevated command prompt and the following syntax:

setspn -s <service class>/<host> <domain>\<service account>

It is a good practice to register SPN for both *<host>* identifiers: hostname and FQDN.

To verify the SPNs are registered correctly use *SETSPN -L <domain>\<service account>*.

PI Data Archive and PI AF are capable to register the SPNs by themselves if their service account is granted the permissions using this PowerShell command:

```
$gMSA = Get-ADServiceAccount -Identity SVC-PIDA  
dscls $gMSA.DistinguishedName /G "SELF:RPWP;servicePrincipalName"  
$gMSA = Get-ADServiceAccount -Identity SVC-PIAF  
dscls $gMSA.DistinguishedName /G "SELF:RPWP;servicePrincipalName"
```

For more detailed information about Service Principal Names beyond the scope necessary for this course visit [Microsoft Docs](#).

Set up Kerberos Delegation

Video: [PI Vision 2020 Installation - Phase 5 - Set up Kerberos Delegation](#)

Introduction

This video demonstrates the steps to set up Kerberos delegation after installing and configuring PI Vision 2020. It is divided into the following sections:

1. Configure the PI Vision Website to Use the Application Pool Credentials
2. Create HTTP Service Principal Names (SPNs)
3. Configure Kerberos Delegation for the PI Vision Service Account
4. Test PI Vision Access Remotely

Part 1: Configure the PI Vision Website to Use the Application Pool Credentials

To configure Kerberos delegation for PI Vision, we will first verify the PI Vision application pool account. In **IIS Manager**, click the web server then click **Application Pools**. Here we can verify that our three PI Vision application pools are running as the same domain service account. Thus, we will follow the **Enable Kerberos delegation using a custom PI Vision service account** section of the PI Vision Installation and Administration guide.

In **IIS Manager**, expand sites and the site where PI Vision is installed (in my case **Default Web Site**), and click the **PIVision** application. Under IIS double click **Authentication** and verify that **Windows Authentication** is enabled. Select **Windows Authentication** and click **Advanced Settings**. In the Advanced Settings window, verify that **Enable Kernel-mode authentication** is checked. Close the **Advanced Settings** window and click **Providers**. Verify that the **Enabled Providers** are **Negotiate** at the top and **NTLM** below. Close the **Providers** window.

Next, click the **PIVision** application and under **Management** double click **Configuration Editor**. In the Section field, navigate to **system.webServer/security/authentication/** and select **windowsAuthentication**. Set the **useAppPoolCredentials** property to **True** and click **Apply**. Finally, open command prompt as an administrator and run the **iisreset** command.

Part 2: Create HTTP Service Principal Names (SPNs)

The next step to configuring Kerberos is to create the HTTP service principal names (or SPN) under the PI Vision application pool account. To do this, you will need the Validated Write to Service Principal Names privilege on the user in Active Directory. Contact your IT for assistance if you do not have this privilege.

Open **command prompt** as an administrator and use the **setspn -s** command to create an HTTP SPN for the netbios name of the PI Vision web server following the format shown (**setspn -s HTTP/netbios-server-name domain\service-account**). After entering the command, verify no errors are returned.

Next use the **setspn -s** command to create an HTTP SPN for the fully qualified DNS name of the PI Vision web server following the format shown (**setspn -s HTTP/fully-qualified-DNS-name domain\service-account**). After entering the command, verify no errors are returned.

To verify the SPNs are correctly registered under the PI Vision domain service account, use the `setspn -l` command following the format shown. Verify the two HTTP SPNs for the PI Vision web server are returned.

Part 3: Configure Kerberos Delegation for the PI Vision Service Account

The final step is to configure Kerberos delegation for the PI Vision service account. For this step you will need access to a domain controller. Contact your IT for assistance if you do not have this access.

On the domain controller, open **Active Directory Users and Computers**. Find the PI Vision domain account. It may be under **Users**. Right click the name of the PI Vision domain account and click **Properties**. In the Properties window, click the **Delegation** tab and select **Trust this user for delegation to specified services only**. Under this option, select **Use any authentication protocol**. We recommend this setting for delegation as it allows users who've authenticated to PI Vision using NTLM to still be able to use Kerberos delegation.

Next we will add services for each PI Data Archive that PI Vision will access. In the **Delegation** tab, click **Add** to open the **Add Services** window. Click **Users or Computers**. In the **Select Users or Computers** window, enter the name of the PI Data Archive. Note that if your PI Data Archive is using a custom service account, search for that name instead. Click **Check Names** then **OK**. In the **Add Services** window, under **Available services**, select **PIServer** and then click **OK**. Repeat these steps for every PI Data Archive that PI Vision will access.

After all of the PIServer services have been added to the services list, we will add services for each AF Server that PI Vision will access. One note is that my AF Servers are running as a domain service account. Shown here in `services.msc` for each AF Server in the PI AF Application Service. Again, in the **Delegation** tab for the PI Vision service account, click **Add** to open the **Add Services** window. Click **Users or Computers**. In the **Select Users or Computers** window, I will enter the PI AF Application service account because that's what my AF Server is running as. If your AF Server is instead running as a machine account, enter the AF Server machine name. Click **Check Names** then **OK**. In the **Add Services** window, under **Available services**, select **AFServer** and click **OK**. Repeat these steps for every AF Server that PI Vision will access.

After all PIServer and AFServer services have been added to the services list, click **Apply**.

Part 4: Test PI Vision Access Remotely

Now that Kerberos delegation has been configured, we can test PI Vision remote access. On a client machine, open a web browser and enter the PI Vision site URL. By default, the PI Vision site will be located at **<https://webserver/PIVision>** where `webserver` is the name of the PI Vision web server.

Once the PI Vision home page appears make sure there are no errors and the PI ProcessBook import folders appear under Home. Because we updated the PI Vision website to use a domain certificate, we don't have any certificate errors on the client machine. Click **New Display** and in the new display window, enter a search term in the Assets pane to verify searching is working. Select a data item and drag it onto the display to make sure clients can see data for each PI Data Archive and AF Server. Keep in mind for other users to access PI Vision they will need to be in the **PI Vision Users** group. In addition, to see data they will need to have appropriate read permissions on each PI Data Archive and AF Server through mappings.

Conclusion

With that we have a successful PI Vision installation and configuration. And users are now able to access data from our PI Servers remotely over the web. If you have any problems or receive any different behavior, note the behavior or errors you receive in PI Vision. In addition, you can check the Event Viewer Logs on the PI Vision web server. Open **Event Viewer** and expand **Applications and Services Log**. The PI Vision logs will be the four logs that start with OSIsoft. You can send this information to our product support team. Thanks for watching and hope you are enjoying your PI Vision installation.

Exercise

Perform the steps to set up Kerberos Delegation on the virtual environment. You will need to make some adaptations to the setup at hand compared to the video. If you are unsure, have a look at the solution for guidance.

Tasks:

- Configure the PI Vision Website to Use the Application Pool Credentials
- Create HTTP Service Principal Names (SPNs)
- Configure Kerberos Delegation for the PI Vision Service Account
- Test PI Vision Access Remotely

Solution

Configure the PI Vision Website to Use the Application Pool Credentials

Follow steps from the video to check settings. As shown there, you will need to set **useAppPoolCredentials** to **True** and run an **iisreset**.

Create HTTP Service Principal Names (SPNs)

Run a command prompt (cmd) as administrator and type:

```
setspn -s HTTP/PISRV01 pischool\PIVisionService
```

```
setspn -s HTTP/PISRV01.pischool.int pischool\PIVisionService
```

If you want to check what has been created for the user PIVisionService:

```
setspn -l pischool\PIVisionService
```

```

Administrator: Command Prompt
Microsoft Windows [Version 10.0.17763.1879]
(c) 2018 Microsoft Corporation. All rights reserved.

C:\Users\student01.PISCHOOL>setspn -s HTTP/PISRV01 pischool\PIVisionService
Checking domain DC=pischool,DC=int

Registering ServicePrincipalNames for CN=Vision Service,CN=Users,DC=pischool,DC=int
HTTP/PISRV01
Updated object

C:\Users\student01.PISCHOOL>setspn -s HTTP/PISRV01.pischool.int pischool\PIVisionService
Checking domain DC=pischool,DC=int

Registering ServicePrincipalNames for CN=Vision Service,CN=Users,DC=pischool,DC=int
HTTP/PISRV01.pischool.int
Updated object

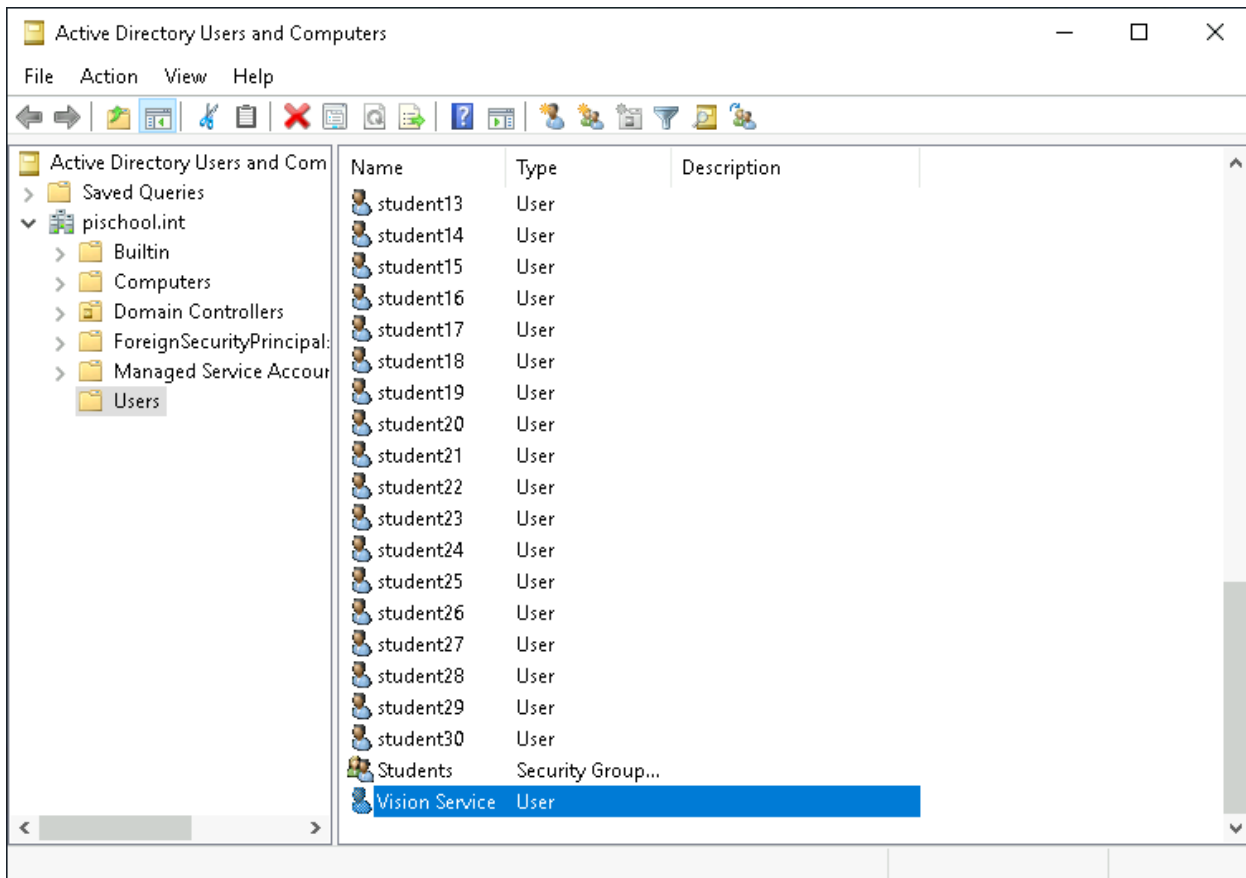
C:\Users\student01.PISCHOOL>setspn -l pischool\PIVisionService
Registered ServicePrincipalNames for CN=Vision Service,CN=Users,DC=pischool,DC=int:
HTTP/PISRV01.pischool.int
HTTP/PISRV01

C:\Users\student01.PISCHOOL>_

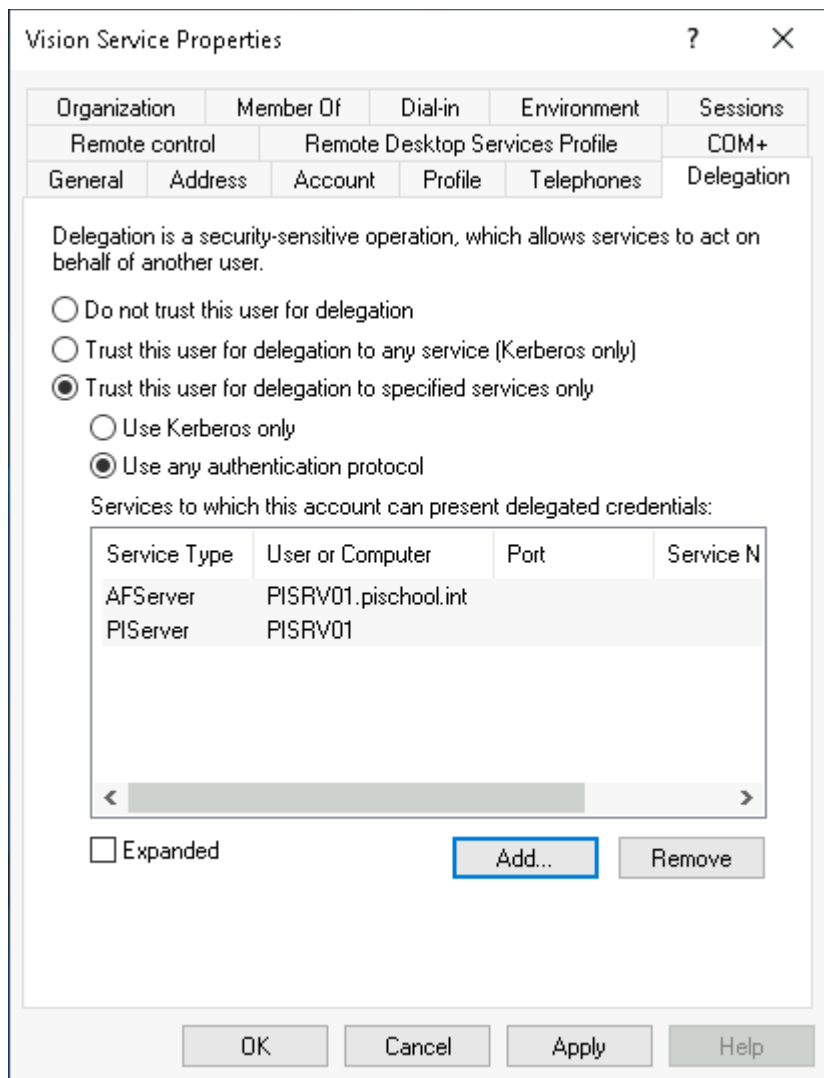
```

Configure Kerberos Delegation for the PI Vision Service Account

Open Active Directory Users and Computers on the Domain Controller. Previously, we have created **PIVisionService** as a domain user. Thus, it can be found under Users:

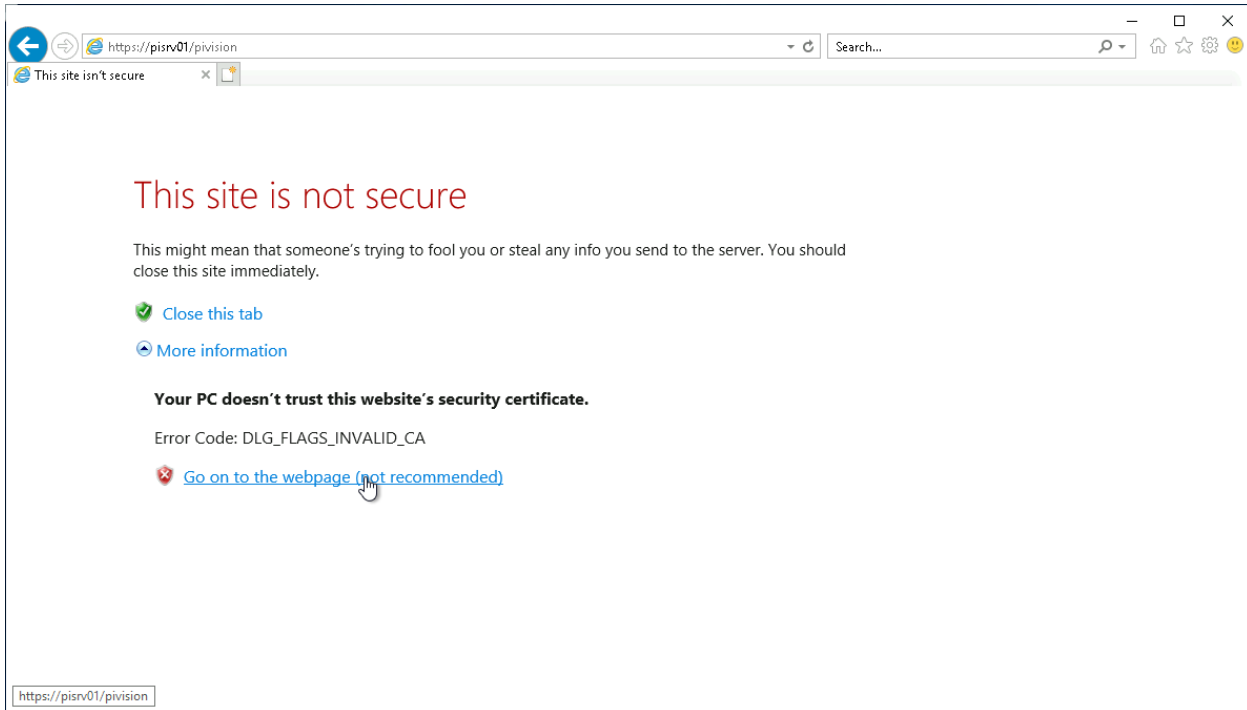


Follow instructions in the video. In contrast to what is demonstrated in the video, the PI AF Application Service on the virtual environment is running under a machine account. As for the Data Archive server before, enter machine name and select AFServer as Service Type as shown.



Test PI Vision Access Remotely

You can test the remote access using the DC, but since we are using the self-signed certificate there will be a certificate warning. You can still access PI Vision by opening up *More information* and clicking *Go on to the webpage (not recommended)*.



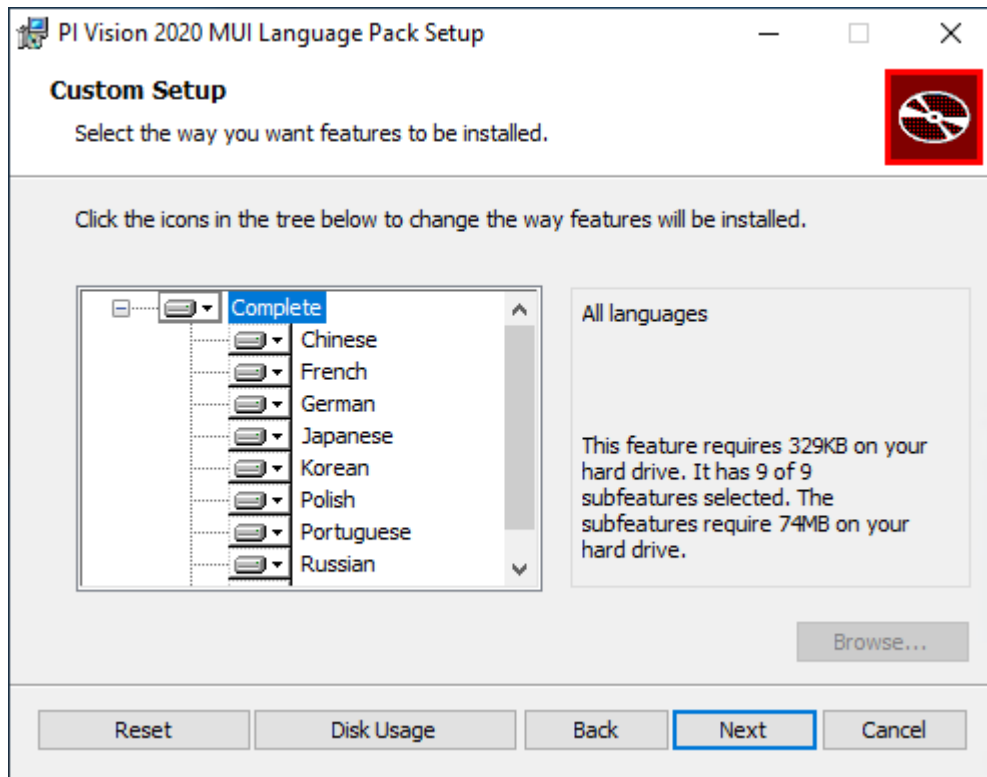
Enabling Users to Change the Display Language

The PI Vision Multilingual User Interface (MUI) is available for download from the [OSIsoft Customer Portal](#).

PI Vision Multilingual User Interface (MUI) support allows users to view the application in eight different languages:

- French
- German
- Spanish
- Polish
- Portuguese
- Simplified Chinese
- Japanese
- Korean
- Russian

During the installation process you can choose to install only the languages which are relevant in your organization.



The PI Vision MUI install kit (PIVisionMUI_2020_) is available for testing on the training environment.

After the MUI is installed on the web server, users can change the language seen in PI Vision by modifying the language settings in their browser.

How the language settings are changed will depend on the browser used. On the training environment you can test it out using Internet Explorer. In Internet Explorer click the Gear icon and select Internet Options. On the General tab click the Languages button in the Appearance section at the bottom of the window. In the Language Preferences window click the button Set Language Preferences to open the settings for Windows display languages. You can add and remove languages here.

As an example, here the appearance of a new display in German language:

