



AYYEKA

Ayyeka DNP3 Outstation Installation Guide

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Introduction

This document guides you through the process of installing an *Ayyeka DNP3 Agent* for use with SCADA systems that support the DNP3 Protocol. Ayyeka DNP3 Agent is a Windows service that runs in the background and enables connectivity between Ayyeka's DB server and a DNP3 master.

Ayyeka collects information from various sensors through data acquisition devices (Industrial IoT gateways/RTUs) called *Wavelets*. This data is maintained in Ayyeka's database, and can be accessed via the Ayyeka DNP3 Agent. The Ayyeka DNP3 Agent service wraps Ayyeka's database as a DNP3 outstation and therefore can be accessed via DNP3 protocol by any DNP3 master. The data from the Ayyeka DNP3 Agent is sent as unsolicited responses to the DNP3 master.

About DNP3

Distributed Network Protocol (DNP3) is a set of communications protocols used between components in process automation systems. Its main use is in utilities such as electric and water companies.

Terminology

In DNP3 terminology, the customer's SCADA system is called a *DNP3 Master*, and the peripheral devices are called *DNP3 Outstations*.

Ayyeka provides an Ayyeka DNP3 Agent which uploads the data collected by Wavelet sites (= Outstations) to the customer's SCADA system via DNP3 protocol.

Level of Compliance

In the DNP3 protocol, a level 1 device is usually a basic meter transmitting very limited data. A level 2 device is usually a small to medium sized controller or RTU. A level 3 device is usually a larger controller or full featured RTU. Level 4 provides additional functions added to the DNP3 protocol that offer features such as floating point variations, LAN time synchronization, and other higher end functions.

The current Ayyeka DNP3 Agent version 3.20.15.599 supports DNP3 up to level 2, with an option to upgrade to and support most level 3 features. The data representation format is group 32 with a 32-bit floating point value with flag and event time (group 32 with variation 7).

Data Transmission

DNP3 protocol runs over TCP. The DNP3 Master initiates one or more TCP connections, called TCP Channels, with the DNP3 Outstations, and keeps the connection open. The Ayyeka DNP3 Agent uses the connections to transmit data in analog format via "Unsolicited Responses", meaning each Wavelet site, represented as a DNP3 outstation, spontaneously transmits a response without having received a specific request for data.

About Ayyeka's Wavelet

Ayyeka's Wavelet™ is an end-to-end remote monitoring system that delivers end-to-end data to decision makers.

Several sensors of various types are integrated with each Wavelet device, which is installed onto existing customer infrastructure. The Wavelet device samples the connected sensors at a configurable sampling frequency. The data obtained from the sensors is stored on the Wavelet device, and transmitted via the cellular network to the Wavelet server at a configurable transmission frequency.

The Ayyeka Wavelet SCADA Agent acts as a bridge between the Wavelet server and the customer's SCADA system, and represents each Wavelet site as a DNP3 outstation.

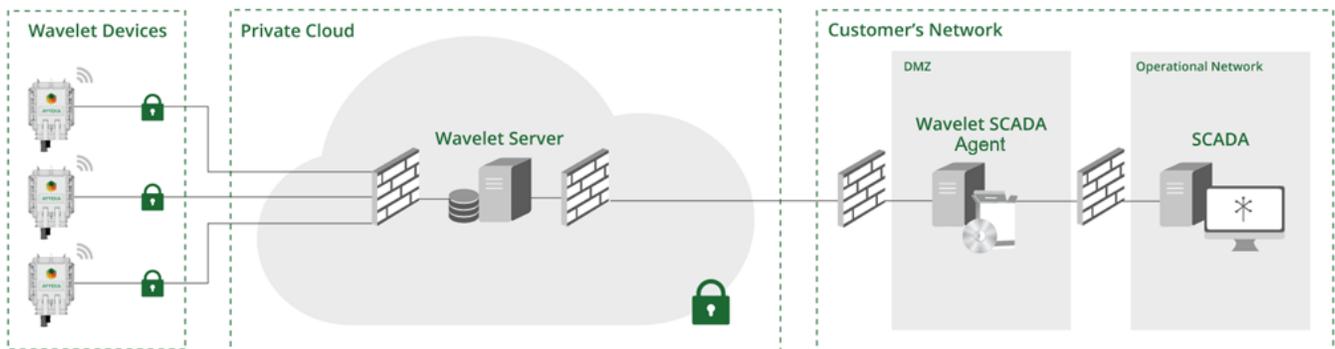


Figure 1: Wavelet integration with customer's SCADA system

System Requirements

- Operating System:
 - Windows Server 2008 or above, 32 or 64 bit
 - Windows 7 and above, 32 or 64 bit
- .Net Framework 4
- Visual C++ Redistributable for Visual Studio 2012
- Windows firewall settings:
 - Ports 80 and 443 for routing TCP sessions

Step 1: Install the Ayyeka DNP3 Agent service

Install the Ayyeka DNP3 Agent Windows service in the same network in which the SCADA system is installed, as follows:

1. Extract the supplied archive to a temporary folder (for example: `C:\temp\AyyekaInstallation`).
2. Double-click the **Ayyeka.Agents.DNP3_v3.20.15.599.msi** file.
3. The Ayyeka.Agents.DNP3 setup wizard is launched. Follow the on-screen instructions. If you wish to specify an installation folder that is different from the default folder (`C:\Ayyeka\Ayyeka.Agents.DNP3`), select **Custom** installation, and enter the destination folder.

After installation is complete:

- The Ayyeka.Agents.DNP3 service is added to the list of Windows services.
- In non-custom installations, an **Ayyeka** directory is added to the C drive, with an **Ayyeka.Agents.DNP3** subfolder. In custom installations, the installation folder is the one specified in the setup wizard.
- After the service is started, a directory for logs is created in `C:\Temp\Ayyeka\Logs`, containing the following log files:
 - **ayyeka.agents.dnp3-all.log**
 - **ayyeka.agents.dnp3-err.log**
 - **ayyeka.agents.dnp3-samples.log**

Uninstalling the Ayyeka DNP3 Agent service

To uninstall the Ayyeka.Agents.DNP3 Windows service, do one of the following:

- In the Ayyeka.Agents.DNP3 installation folder (by default, `C:\Ayyeka\Ayyeka.Agents.DNP3`), double-click the **Ayyeka.Agents.DNP3_v3.20.15.599.msi** file. In the wizard that appears, select **Remove**.

Or

- In the computer's control panel, select **Add/Remove programs**, and select to **Uninstall** Ayyeka.Agents.DNP3.

Once uninstall is complete, the Ayyeka.Agents.DNP3 service is removed.

Step 2: Define the Ayyeka DNP3 Agent credentials

1. Open a command prompt window and navigate to `C:\Ayyeka\Ayyeka.Agents.DNP3\cli.`
2. At the command prompt, enter `akdnp3cli.exe` to see the main CLI options.

```
C:\Ayyeka\Ayyeka.Agents.Dnp3\Cli>akdnp3cli.exe
Ayyeka.Agents.Dnp3 3.20.15.599
Copyright c 2017

info          Print various information about this DNP3 agent.

send-from    For a specific stream, send data from a specific sample onwards
             or a from specific date onwards.

config       Reconfigure the agent.
```

Figure 2: CLI command `akdnp3cli.exe` - main options

3. At the command prompt, enter `akdnp3cli.exe config`.
4. At the prompt, enter the username and password of an Ayyeka user authorized to access the sites whose stream data you wish to upload to the SCADA system.

```
C:\Ayyeka\Ayyeka.Agents.Dnp3\Cli>akdnp3cli.exe config
Reconfiguring dnp3 agent

Please input your ayyeka username [demo]: demo
Please input your ayyeka password [demouser123]: demouser123
```

Figure 3: Running CLI command `akdnp3cli.exe config`

Step 3: Optionally modify communication between the Ayyeka DNP3 Agent and the Ayyeka server

In the installation folder (by default: `C:\Ayyeka\Ayyeka.Agents.DNP3`), open **AyyekaAPIClient.dll.config** with a text editor, and optionally edit the `<appSettings>` section as follows:

1. You can verify the username and password values you had entered in the previous step:

```
<add key="username" value="demo" />
<add key="password" value="demouser123" />
```

2. You can change the `preserved_data` value. This specifies the location (such as `C:\Temp\Ayyeka`) of the files listing the Ayyeka DNP3 Agent working state. One such file, for example, lists the ID of the last sample retrieved from each data stream. If the value is empty (default), the location is the `Ayyeka.Agents.DNP3` subfolder. Ensure that the directory listed in the `preserved_data` field has write permissions.

3. You can change the `preserved_data_backup_dir` value. This specifies the location of the directory hosting backups of the Ayyeka DNP3 Agent working state.
4. You can change the `preserved_data_backup_interval_hours` value. This specifies how often to create a backup of the Ayyeka DNP3 Agent working state.
5. You can change the `number_of_samples_to_download` value. This specifies the number of samples from each data stream that the Ayyeka DNP3 Agent retrieves from the Wavelet server during each data upload session. The maximum allowed value is 1000 samples per stream, and the default value is 100. There is no limit on the number of data streams.
6. You can change the `between_upload_suspend_minutes` value. This specifies the amount of time, in minutes, between connection attempts when the Ayyeka DNP3 Agent is trying to connect to the Ayyeka server. The minimum value is 1 minute and the default value is 5 minutes.
7. You can change the `timeout` value. This specifies the time the Ayyeka DNP3 Agent waits for a reply to a request sent to the Wavelet server. If no reply arrives within the timeout interval, the Ayyeka DNP3 Agent waits `between_upload_suspend_minutes` before attempting to re-establish a TCP session with the Wavelet server. In case of network connection problems, you may want to set the `timeout` to a high number. The default value is 120,000 milliseconds.
8. Save the changes and close the file.

```

<?xml version="1.0" encoding="utf-8"?>
<configuration>
  <configSections>
    <sectionGroup name="applicationSettings" type="System.Configuration.ApplicationSettingsGroup"
      <section name="AyyekaAPIClient.Properties.Settings" type="System.Configuration.ClientSetti
    </sectionGroup>
  </configSections>
  <applicationSettings>
    <AyyekaAPIClient.Properties.Settings>
      <setting name="AyyekaAPIClient_AuthenticationWS_Authentication" serializeAs="String">
        <value>https://soapapi.ayyeka.com/Authentication.asmx</value>
      </setting>
      <setting name="AyyekaAPIClient_DevicesWS_Devices" serializeAs="String">
        <value>https://soapapi.ayyeka.com/APIv2.4/API.asmx</value>
      </setting>
    </AyyekaAPIClient.Properties.Settings>
  </applicationSettings>
  <appSettings>
    <add key="username" value="demo" />
    <add key="password" value="demouser123" />
    <add key="preserved_data" value="" />
    <add key="preserved_data_backup_dir" value="" />
    <add key="preserved_data_backup_interval_hours" value="" />
    <add key="number_of_samples_to_download" value="100" />
    <add key="between_upload_suspend_minutes" value="5" />
    <add key="api_url" value="https://soapapi.ayyeka.com/APIv2.4/API.asmx" />
    <add key="authentication_url" value="https://soapapi.ayyeka.com/Authentication.asmx" />
    <add key="timeout" value="120000" />
  </appSettings>
  <startup>
    <supportedRuntime version="v4.0" sku=".NETFramework,Version=v4.5" />
  </startup>
</configuration>

```

Figure 4: AyyekaAPIClient.dll.config

Step 4: Launch the Ayyeka.Agents.DNP3 service

1. Navigate to **Computer Management > Services**.
2. Right click the **Ayyeka.Agents.DNP3** service and select **Start**.

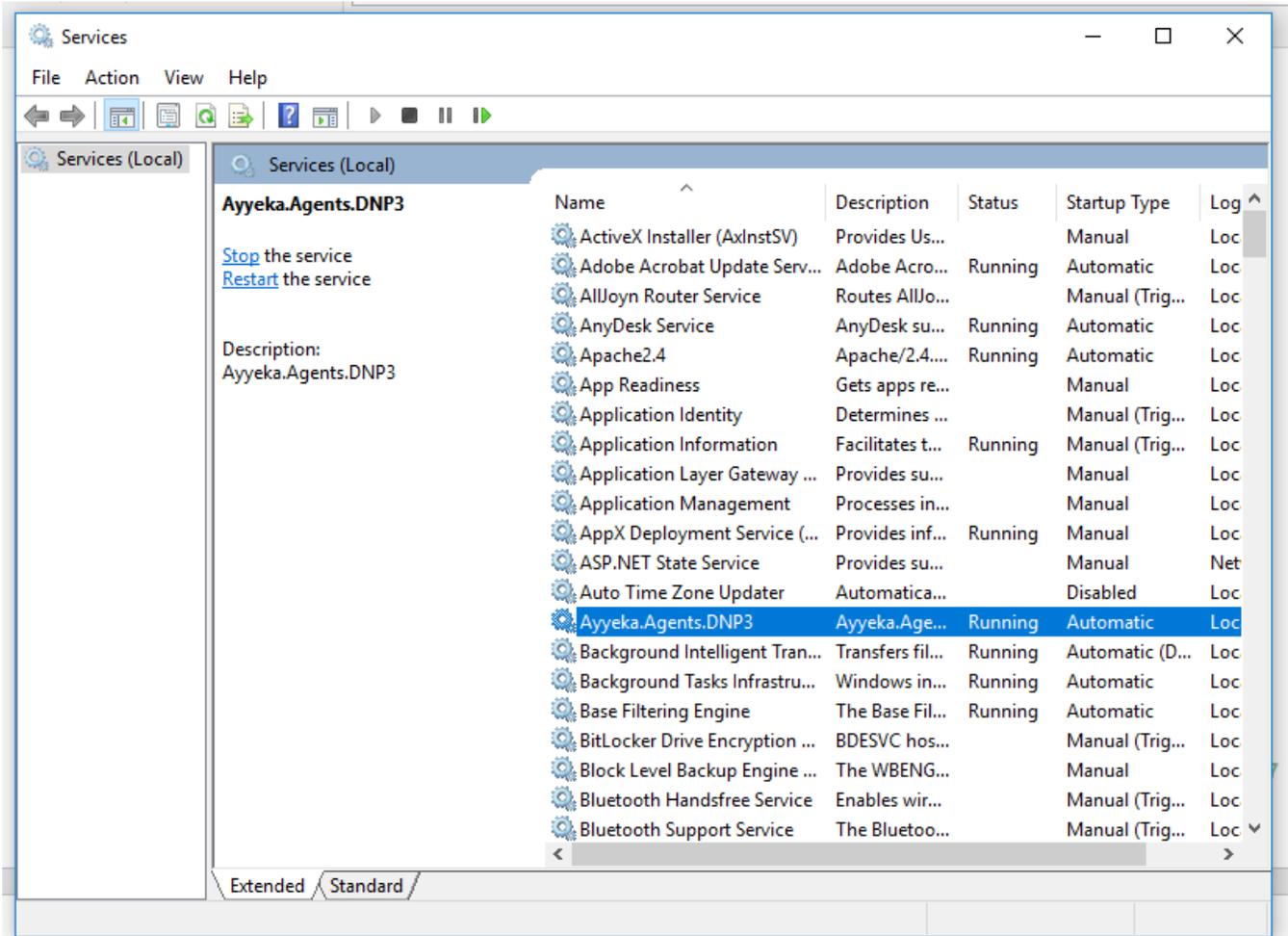


Figure 5: Windows Services window

Step 5: Data mapping and uploading

Understanding data mapping

Sensor measurements are stored in Ayyeka's database in a hierarchical structure that matches the actual deployment of the Ayyeka devices and their sensors. Each customer has a user account accessed via a username and password. For each customer account, the Ayyeka data model includes the following entities:

- **Site** – A logical entity representing a Wavelet installation site. A site contains one or more devices.
- **Device** – Represents a physical Wavelet device installed in the field. Each device belongs to a specific Site.
- **Stream** – A logical entity representing a sequence of measurements from a specific sensor parameter.
- **Sample** – Represents a measurement at a specific moment in time. Each sample belongs to a specific Stream.

Each Site, Device, Stream and Sample has a unique ID that identifies it.

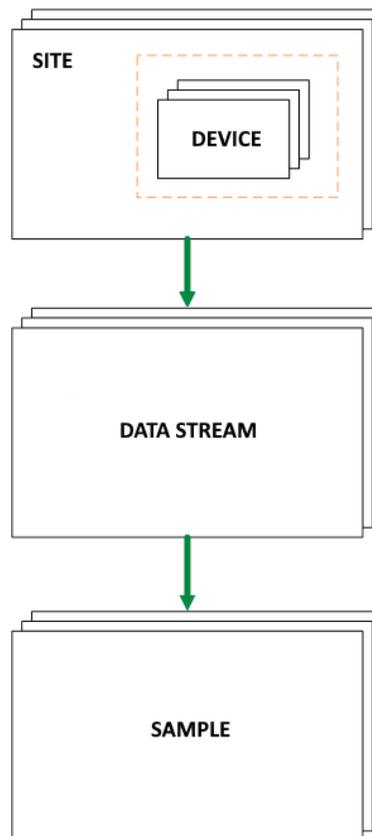


Figure 6: Ayyeka data model

Typically, there are numerous Wavelet devices in the field and each of them generates one or more data streams (such as Level, GSM signal, Battery Status, etc.). Each Wavelet site is mapped to a DNP3 outstation. Each outstation is the data source for a number of DNP3 index IDs, where each index ID represents a specific Wavelet stream. Whenever the Ayyeka DNP3 Agent encounters a new stream when it connects to the Wavelet server, it generates a new corresponding DNP3 index ID.

Understanding data uploading

Data from Ayyeka sites is uploaded to the SCADA system via TCP channels. By default, the Ayyeka DNP3 Agent groups all the Ayyeka sites under the single "Default" channel. Furthermore, any additional new site is automatically allocated to the "Default" TCP channel.

When the Ayyeka.Agents.DNP3 service is started, it creates a **Dnp3ChannelMapping** XML file that lists all the channels and their sites. This file is updated each time the Ayyeka DNP3 Agent retrieves data from the Wavelet server. In the example **Dnp3ChannelMapping** file shown below, all the sites are allocated to the **Default** TCP channel with port no. 20000.

```
<?xml version="1.0"?>
<ChannelMapping xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  <Channels>
    <Dnp3Channel Name="Default" Port="20000">
      <Sites>
        <Site Id="29" Name="Stream Demo" />
        <Site Id="30" Name="Pressure Demo" />
        <Site Id="109" Name="Tap Water Quality" />
        <Site Id="110" Name="Turbidity" />
        <Site Id="111" Name="Pressure Monitoring" />
        <Site Id="112" Name="Wastewater quality" />
        <Site Id="113" Name="Pressure Monitoring 2" />
        <Site Id="194" Name="Demo Site" />
      </Sites>
    </Dnp3Channel>
  </Channels>
</ChannelMapping>
```

Figure 7: Dnp3ChannelMapping with a single TCP channel

Stage A: Distribute the load

For load balancing purposes, it is recommended to allocate no more than 30 Ayyeka sites to a single TCP channel. If you are uploading data from over 30 sites, you should create additional TCP channels, as follows:

1. Stop the **Ayyeka.Agents.DNP3** service.
2. In the installation folder (by default: C:\Ayyeka\Ayyeka.Agents.DNP3), open **Dnp3ChannelMapping.dll.config** with a text editor, and modify it as follows:
 - a. Define additional TCP channels, each with a unique name and port number.
 - b. Allocate the sites to the channels as you see fit. You might, for example, group sites in channels based on the type of data they are monitoring. In the example shown below, all the

Pressure monitoring sites were grouped under the newly created `Pressure_channel` channel.

```

<?xml version="1.0"?>
<ChannelMapping xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  <Channels>
    <Dnp3Channel Name="Default" Port="20000">
      <Sites>
        <Site Id="29" Name="Stream Demo" />
        <Site Id="109" Name="Tap Water Quality" />
        <Site Id="110" Name="Turbidity" />
        <Site Id="112" Name="Wastewater quality" />
        <Site Id="194" Name="Demo Site" />
      </Sites>
    </Dnp3Channel>
    <Dnp3Channel Name="Pressure_channel" Port="20001">
      <Sites>
        <Site Id="30" Name="Pressure Demo" />
        <Site Id="111" Name="Pressure Monitoring" />
        <Site Id="113" Name="Pressure Monitoring 2" />
      </Sites>
    </Dnp3Channel>
  </Channels>
</ChannelMapping>

```

Figure 8: Dnp3ChannelMapping with two channels

- Restart the `Ayyeka.Agents.DNP3` service.

Stage B: Change firewall settings

If the Ayyeka DNP3 Agent and your SCADA system are hosted on two separate machines, make the following firewall setting changes:

In the machine hosting the SCADA, open the ports defined in `Dnp3ChannelMapping.dll.config` for outgoing TCP communication in the user's internal network. In the example shown in Figure 8, those ports are port 20000 and port 20001.

Stage C: Optionally modify communication between the SCADA System and the Ayyeka DNP3 Agent

In the installation folder (by default: C:\Ayyeka\Ayyeka.Agents.DNP3), open

Ayyeka.Agents.DNP3.exe.config with a text editor, and optionally edit the <userSettings> section as follows:

1. Set the `TcpRetryMilliseconds` value to the number of milliseconds between TCP connection attempts.

For example:

```
<setting name="TcpRetryMilliseconds" serializeAs="String">  
  <value>5000</value>  
</setting>
```

2. Set the `IpAddress` value to the IP address of the network card to which the Ayyeka DNP3 Agent listens, and to which the DNP3 Master will connect.

If the Ayyeka DNP3 Agent is installed on the same computer as the DNP3 Master, the IP address should be 127.0.0.1.

For example:

```
<setting name="IpAddress" serializeAs="String">  
  <value>127.0.0.1</value>  
</setting>
```

3. Set the `MasterDnp3Address` value to the DNP3 address of the DNP3 Master. For example:

```
<setting name="MasterDnp3Address" serializeAs="String">  
  <value>0</value>  
</setting>
```

4. Set the `UploadSampleSleepMilliseconds` value to the data upload rate according to the DNP3 master capacity. This is the rate at which unsolicited responses are sent to the SCADA system, where each unsolicited response consists of a single data point. Some SCADA systems are slow, and if the upload rate is too high, some data is lost. The default rate is 1 second.

For example:

```
<setting name="UploadSampleSleepMilliseconds" serializeAs="String">  
  <value>1000</value>  
</setting>
```

5. Set the `RetrieveSamplesSleepMinutes` value. This specifies the amount of time, in minutes, between each data upload from the Wavelet server. The minimum value is 1 minute and the default value is 5 minutes. For example:

```
<setting name="RetrieveSamplesSleepMinutes" serializeAs="String">  
  <value>5</value>  
</setting>
```

6. Set the `Dnp3LogLevel` value. This specifies the minimum severity level to display in the logs. The available levels are INFO, ERROR, and FATAL.

For example:

```
<setting name="Dnp3LogLevel" serializeAs="String">
  <value>ERROR</value>
</setting>
```

7. Set the `ChannelMappingPath` value. This specifies the name and path of the `Dnp3ChannelMapping.xml` file. If empty (default), the location is the `Ayyeka.Agents.DNP3` subfolder.

For example:

```
<setting name="ChannelMappingPath" serializeAs="String">
  <value>Dnp3ChannelMapping.xml</value>
</setting>
```

8. Save the changes and close the file.



```
<section name="Ayyeka.Agents.Dnp3.Settings" type="System.Configuration.
  PublicKeyToken=b77a5c561934e089" allowExeDefinition="MachineToLocalUser
</sectionGroup>
</configSections>
<startup>
  <supportedRuntime version="v4.0" sku=".NETFramework,Version=v4.0" />
</startup>
<userSettings>
  <Ayyeka.Agents.Dnp3.Settings>
    <setting name="TcpRetryMilliseconds" serializeAs="String">
      <value>5000</value>
    </setting>
    <setting name="IpAddress" serializeAs="String">
      <value>127.0.0.1</value>
    </setting>
    <setting name="MasterDnp3Address" serializeAs="String">
      <value>0</value>
    </setting>
    <setting name="UploadSampleSleepMilliseconds" serializeAs="String">
      <value>1000</value>
    </setting>
    <setting name="RetrieveSamplesSleepMinutes" serializeAs="String">
      <value>5</value>
    </setting>
    <setting name="Dnp3LogLevel" serializeAs="String">
      <value>ERROR</value>
    </setting>
    <setting name="ChannelMappingPath" serializeAs="String">
      <value>Dnp3ChannelMapping.xml</value>
    </setting>
  </Ayyeka.Agents.Dnp3.Settings>
</userSettings>
</runtime>
```

Figure 9: Ayyeka.Agents.DNP3.exe.config

Stage D: Optionally change the location of the Ayyeka DNP3 Agent log files

In the installation folder (by default: C:\Ayyeka\Ayyeka.Agents.DNP3), open the **Log4net.config** file with a text editor, and optionally edit it as follows:

1. Specify the folder where the outstation's logs will be located. By default, the folder for all logs is C:\Temp\Ayyeka\Logs.

For example:

```
<file value="C:\Temp\Ayyeka\Logs\ayyeka.agents.dnp3-all.log" />
<file value=" C:\Temp\Ayyeka\Logs\ayyeka.agents.dnp3-err.log" />
<file value=" C:\Temp\Ayyeka\Logs\ayyeka.agents.dnp3-samples.log" />
```

2. Ensure that the folder(s) you specify have write permissions.
3. Save the changes and close the file.

Stage E: Obtain the site information to enter in your SCADA system

To be able to upload the data from the Ayyeka streams into your SCADA system, you need to learn certain Ayyeka parameters' values for entering into your SCADA system. To do so:

1. Open a command prompt window and navigate to C:\Ayyeka\Ayyeka.Agents.DNP3\cli.
2. At the command prompt, enter `akdnp3cli.exe info`.

```
C:\Ayyeka\Ayyeka.Agents.Dnp3\Cli>akdnp3cli.exe info
```

Site Id	Site Name	Stream Id	Stream Name	Analog Number	Last Sample Date
29	Stream Demo	127	Rain	0	01/01/0001 00:00:00
29	Stream Demo	142	Level	1	01/01/0001 00:00:00
29	Stream Demo	143	Conductivity	2	01/01/0001 00:00:00
29	Stream Demo	144	TSS	3	01/01/0001 00:00:00
30	Pressure Demo	128	Pressure	0	01/01/0001 00:00:00
109	Tap Water Quality	664	Chlorine 1	0	01/01/0001 00:00:00
109	Tap Water Quality	665	Chlorine 2	1	01/01/0001 00:00:00
109	Tap Water Quality	666	Temp	2	01/01/0001 00:00:00
109	Tap Water Quality	667	Conductivity	3	01/01/0001 00:00:00
109	Tap Water Quality	668	Pressure	4	01/01/0001 00:00:00
110	Turbidity	670	???	0	01/01/0001 00:00:00
110	Turbidity	671	Turbidity	1	01/01/0001 00:00:00
111	Pressure Monitoring	672	Pressure1	0	01/01/0001 00:00:00
111	Pressure Monitoring	673	Pressure2	1	01/01/0001 00:00:00
111	Pressure Monitoring	674	Flow	2	01/01/0001 00:00:00
112	Wastewater quality	676	pH	0	01/01/0001 00:00:00
112	Wastewater quality	677	pH-Sensor-Temp	1	01/01/0001 00:00:00
112	Wastewater quality	678	Conductivity	2	01/01/0001 00:00:00
112	Wastewater quality	679	Conductivity-Sensor-Temp	3	01/01/0001 00:00:00
112	Wastewater quality	680	Buoy	4	01/01/0001 00:00:00
113	Pressure Monitoring 2	675	Pressure	0	01/01/0001 00:00:00
194	Demo Site	998	pH	0	01/01/0001 00:00:00

Figure 10: Running CLI command `akdnp3cli.exe info`

The command output provides the following information for all the Ayyeka sites in the database:

Field	Description	Comments
Site Id	The ID of the site in the Ayyeka server. This is also the Outstation ID in the SCADA system.	Required for SCADA configuration
Site Name	The name of the site in the Ayyeka server.	
Stream Id	The ID of the stream in the Ayyeka server.	
Stream Name	The name of the stream in the Ayyeka server.	
Analog Number	This is the DNP3 analog index ID for the particular site and stream.	Required for SCADA configuration
Last Sample Date	The sample date of the sample most recently sent from this stream by the Ayyeka DNP3 Agent to the SCADA system.	

- For each site and stream whose data you want to upload to your SCADA system, note the site's `SiteID` and the stream's `Analog Number`.
- For your convenience, you can use the various options of the `akdnp3cli.exe info` CLI command to:
 - Show information for a specific site only.
 - Show information for a specific stream only.
 - Output information to a CSV file.

To view the syntax of these options, enter: `akdnp3cli.exe info -help`
The following appears:

```
C:\Ayyeka\Ayyeka.Agents.Dnp3\Cli>akdnp3cli.exe info --help
Ayyeka.Agents.Dnp3 3.20.15.599
Copyright c 2017

-s, --site      Display information about the site whose ID is specified
                (mutually exclusive with --stream)

-t, --stream    Display information about the stream whose ID is specified
                (mutually exclusive with --site)

-o, --out       Output the information to a specified CSV file instead of
                displaying it in the console

-f, --force     (Default: False) Overwrite the output CSV file without
                requesting confirmation (in conjunction with --out)
```

Figure 11: Options of CLI command `akdnp3cli.exe info`

For example:

- To display information for site 29 only, run `akdnp3cli.exe info -s 29`.
The output will look similar to the following:

```
C:\Ayyeka\Ayyeka.Agents.Dnp3\Cli>akdnp3cli.exe info -s 29
Site Id   Site Name   Stream Id Stream Name   Analog Number   Last Sample Date
=====
29        Stream Demo 127         Rain           0                01/01/0001 00:00:00
29        Stream Demo 142         Level          1                01/01/0001 00:00:00
29        Stream Demo 143         Conductivity   2                01/01/0001 00:00:00
29        Stream Demo 144         TSS            3                01/01/0001 00:00:00
```

- To display information for stream 142 only, run `akdnp3cli.exe info -t 142`.
The output will look similar to the following:

```
C:\Ayyeka\Ayyeka.Agents.Dnp3\Cli>akdnp3cli.exe info -t 142
Site Id   Site Name   Stream Id Stream Name   Analog Number   Last Sample Date
=====
29        Stream Demo 142         Level          1                01/01/0001 00:00:00
```

- To export the information regarding site 29, to the `info_out` CSV file located in `C:\temp`, run `akdnp3cli.exe info -s 29 -o c:\temp\info_out.csv`.

```
C:\Ayyeka\Ayyeka.Agents.Dnp3\Cli>akdnp3cli.exe info -s 29 -o c:\temp\info_out.csv
```

The generated CSV file will look similar to the following:

```
1 SiteId,SiteName,StreamId,StreamName,ExternalId,LastSampleId,LastSampleDate
2 29,Stream Demo,127,Rain,0,0,1/1/0001 12:00:00 AM
3 29,Stream Demo,142,Level,1,0,1/1/0001 12:00:00 AM
4 29,Stream Demo,143,Conductivity,2,0,1/1/0001 12:00:00 AM
5 29,Stream Demo,144,TSS,3,0,1/1/0001 12:00:00 AM
6
```

Stage F: Optionally restrict the data to upload

You may wish to instruct the Ayyeka DNP3 Agent to upload to your SCADA system only some of the sampling data residing in the Ayyeka server. This can be useful, for example, if you are only interested in a specific stream's data from a certain date onwards.

The option of restricting data upload can be utilized also after the Ayyeka DNP3 Agent is up and running. For example, if certain data is erroneously deleted from the SCADA system and you wish to back-fill, you can use the `restrict` option to instruct the Ayyeka DNP3 Agent to re-upload the particular data you are missing.

The `restrict` option is implemented by running the `akdnp3cli.exe send-from` CLI command. Using the command, you can specify that for a particular stream, the Ayyeka DNP3 Agent should only collect sample data from a specific sample ID onwards, or from a specific date onwards.

To restrict data upload:

1. Open a command prompt window and navigate to `C:\Ayyeka\Ayyeka.Agents.Dnp3\cli`.
2. At the command prompt, enter `akdnp3cli.exe send-from`.

The command syntax is displayed:

```
C:\Ayyeka\Ayyeka.Agents.Dnp3\Cli>akdnp3cli.exe send-from
Ayyeka.Agents.Dnp3 1.0.0.0
Copyright c 2017

-t, --stream      Required. Upload samples only from the stream whose ID is
                  specified

-i, --id          The ID of the sample from which to begin uploading samples
                  (mutually exclusive with --date). 0 denotes uploading from
                  the very first sample

-d, --date       The date from which to begin uploading samples, in the format
                  yyyy-mm-dd (mutually exclusive with --id)
```

Figure 12: Options of CLI command `akdnp3cli.exe send-from`

For example:

- To upload from stream 142, samples starting from sample ID 106954, run:
`akdnp3cli.exe send-from -t 142 -i 106954`.

```
C:\Ayyeka\Ayyeka.Agents.Dnp3\Cli>akdnp3cli.exe send-from -t 142 -i 106954
```

- To upload from stream 142, all its samples starting from the very first one, run:
`akdnp3cli.exe send-from -t 142 -i 0`

```
C:\Ayyeka\Ayyeka.Agents.Dnp3\Cli>akdnp3cli.exe send-from -t 142 -i 0
```

- To upload from stream 142, samples starting from January 27, 2017, run:
`akdnp3cli.exe send-from -t 142 -d 2017-01-27`.
The system contacts the API to learn which sample ID corresponds to the given date.

```
C:\Ayyeka\Ayyeka.Agents.Dnp3\Cli>akdnp3cli.exe send-from -t 142 -d 2017-01-27
Contacting API to get sample ID
```