INDUSTRIAL AUTOMATION SOFTWARE

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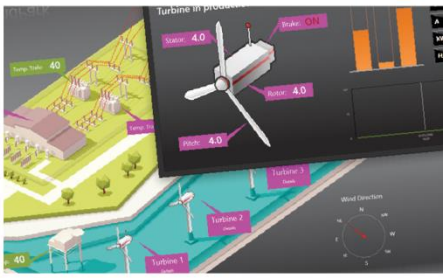

Movicon NExT

3.4 Alarms

Ver.3.4.268

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1. Alarms

1.1.1. TripAlarms type

A "TripAlarm" alarm is a simple alarm which has one activation threshold. It is a normal "ON/OFF" alarm which activates or deactivates according to the set value and condition. For example, if the following Value and Condition are set:

Activation Condition = GreaterThanOrEqual
Activation Value = 1

The alarm will activate when the Tag value is equal to or greater than 1.

For further information please refer to paragraph: "Alarm Prototype Settings".

1.1.2. ExclusiveLevel and NonExclusiveLevel Alarm types

A "Level" alarm type has four intervention thresholds. In this case, the thresholds can be exclusive or not. This type of alarm intervenes only when the Tag value exceeds the set threshold value. For example if the four alarm thresholds are set with the following values:

High High Level = 10
High Level = 5
Low Level = -5
Low Low Level = -10

The alarm goes off with the "High Level" intervention threshold when the variable value becomes higher than 5. The alarm will go off (activates) with the "Low Level" intervention when the variable value becomes less than -5.
When the alarm is defined as "Exclusive Level" type, each intervention threshold will be exclusive. Therefore when for example the "High High" threshold activates, the "High" threshold deactivates. When the alarm is defined as "NonExlusive Level" type, the intervention thresholds will not be exclusive. Therefore for example, when the "High High" threshold activates so will the "High" threshold. In Runtime alarm discrimination based on its activation status, which is also visible in the "Alarm Window", despite whether it is exclusive or not. When an alarm is Exclusive type its activation Status will be recorded with the following text:

HighHigh|...
High|...
Low|...
LowLow|...

when an alarm is a Non Exclusive type, its activation Status will be recorded with the following text:

HighHighActive|...
HighActive|...

LowActive|...
LowLowActive|...

For further information see paragraph on "Alarm Prototype Settings".

1.1.3. ExclusiveDeviation and NonExclusiveDeviation Alarm types

A "Deviation" alarm type has four intervention thresholds which can be exclusive or non exclusive.
The Threshold values for this type of alarm have a particular meaning according to the settings in the **"Deviation Type"** parameter. The alarm will behave according to the "Deviation Type" selection as described below. For further information please see the paragraph on "Alarm Prototype Settings".

When the alarm is defined as "Exclusive Deviation" type, each intervention threshold will be exclusive, therefore when the "High High" threshold activates the "High" threshold deactivates. When the alarm is defined as "NonExlusive Deviation" type, the intervention threshold will not be exclusive. Therefore when, for example, the "High High" threshold activates so will the "High" threshold. In Runtime the exclusion of an alarm is based on its Status, which is also visible in the "Alarm Window", whether the alarm be exclusive or non exclusive. When an alarm is an Exclusive type, its activation Status will be recorded with the following text:

HighHigh|...
High|...
Low|...
LowLow|...

When an alarm is a Non Exclusive, its activation Status will be recorded with the following text:

HighHighActive|...
HighActive|...
LowActive|...
LowLowActive|...

Deviation Type = AbsoluteValue

When the deviation type has an absolute value (Deviation Type = AbsoluteValue), the alarm intervenes only when the Tag value changes to a higher value to the one set in the thresholds. For example, if the four alarm thresholds are set with the following values:

High High Level = 10
High Level = 5
Low Level = -5
Low Low Level = -10

The alarm will trigger with the 'High Level' intervention threshold when the variable's value undergoes a variation of at least 6 positive units, for example if its value switches from 30 to 36.

The alarm will trigger with the "Low Level" intervention threshold when the variable value undergoes a variation of at least 6 negative units, for example if its value switches from 30 to 24.

Deviation Type = PercentOfValue

When the deviation type is set as a percentage of the value (Deviation Type = PercentOfValue) the values set in the thresholds will be considered as percentage values to be applied to the Tag value. The alarm will triggerif the Tag undergoes a variation higher to the Tag's percentage value. For example if the four alarm thresholds are set with the following values:

High High Level = 100%
High Level = 50%
Low Level = -50%
Low Low Level = -100%

and the current Tag value is 10, this means that the four intervention threshold will instantly be calculated with the following values:

High High Threshold = 20
High Threshold = 15
Low Threshold = 5
Low Low Threshold = 0

the value is established by taking the percentage rate of the Tag value and then adding it to actual Tab value itself. For example:

High High Threshold = (100% di 10) + 10 = 20
High Threshold = (50% di 10) + 10 = 15
Low Threshold = -(50% di 10) + 10 = 5
Low Low Threshold = -(100% di 10) + 10 = 0

By following the example described above the alarm will trigger with the "High Level" intervention threshold when the variable value undergoes a variation of at least 6 positive units, for example if its value passes from 10 to 16. The alarm will go off with the "Low Level" intervention threshold when the variable undergoes a variation of at least 6 negative units, for example if its value passes from 10 to 4.

Warning! Each time the Tag changes value, the intervention thresholds will be recalculated based on the new value.

Deviation Type = PercentOfEURange

When the deviation type is set as the percentage of the scaled value of the engineering unit associated to the Tag (Deviation Type = PercentOfEURange). The values set in the thresholds will be considered as a percentage value to be applied to the scaled value of the engineering unit associated to the Tag. The alarm triggers when the tag variation exceeds the percentage value of the difference of the scaled value limits. For example, if the alarm's four thresholds are set with the following values:

High High Level= 20%
High Level = 10%
Low Level = -10%
Low Low Level = -20%

and the Engineering Unit associated to the Tag has the following values:

Engineering Unit Low Value = -100
Engineering Unit High Value = 100
Low Raw Input Value = -50
High Raw Input Value = 50

and the actual value of the Tag is 10, means that the four threshold values will at that moment be calculated with the following values:

High High Threshold = 50
High Threshold = 30
Low Threshold = -10
Low Low Threshold = -30

The value is obtained by calculating the difference between the minimum and maximum of the scaled value and then adding the value of the actual Tag. For example:

High High Threshold = (20% di (100 - (-100))) + 10 = 50
High Threshold = (10% di (100 - (-100))) + 10 = 30
Low Threshold = -(10% di (100 - (-100))) + 10 = -10
Low Low Threshold = -(20% di (100 - (-100))) + 10 = -30

By following the example reported above, the alarm will sound with the "High Level" intervention threshold when the variable's value undergoes a variation of at least 21 units in positive, for example if its value passes from 10 to 31. The alarm will sound with the "Low Level" intervention threshold when the variable's value undergoes a variation of at least 21 units in negative, for example when its value passes from 10 to -11.

Warning! Each time the Tag changes value, the intervention thresholds will be recalculated according to the new value.

Deviation Type = PercentOfRange

When the deviation type is set as the percentage of the raw value of the Engineering Unit associated to the Tag (Deviation Type = PercentOfRange) the values set in the thresholds will be considered as the percentage value to apply to the raw value of the Engineering Unit associated to the Tag. The alarm triggers when the Tag variation exceeds the percentage value of the difference of the raw value limits. For example, if the four alarm thresholds are set with the following values:

High High Level = 20%
High Level = 10%
Low Level = -10%
Low Low Level = -20%

and the Engineering Unit associated to the Tag has the following values:

Engineering Unit Low Value = -100
Engineering Unit High Value = 100
Low Raw Input Value = -50
High Raw Input Value = 50

and the Tag's actual value is 10, means that at that moment the four intervention thresholds will be calculated with the following values:

High High Threshold= 30
High Threshold= 20
Low Threshold= 0
Low Low Threshold= -10

the value is obtained by calculating the percentage of the difference between the minimum and maximum of the raw value and then adding the Tag's actual value. For example:

High High Threshold= (20% di (50 - (-50))) + 10 = 30
High Threshold= (10% di (50 - (-50))) + 10 = 20
Low Threshold= -(10% di (50 - (-50))) + 10 = 0
Low Low Threshold= -(20% di (50 - (-50))) + 10 = -10

By following the example above the alarm will sound with the "High Level" intervention threshold when the variable's value undergoes a variation of at least 11 units in positive, for example if its value passes from 10 to 21. The alarm will sound with the "Low Level" intervention threshold when the variable value undergoes a variation of at least 11 unit in negative, for example when it's value passes from 10 to -1.

Warning! Each time the Tag changes value, the intervention threshold will be recalculated in function with the new value.

1.1.4. ExclusiveRateOfChange and NonExclusiveRateOfChange Alarm types

A "Rate Of Change" alarm type has four intervention thresholds. In this case the thresholds can be exclusive of non exclusive.
For this type of alarm the threshold values obtain a certain significance according to the **"Deviation Type"** parameter. In addition it is also necessary to set a sample time interval using the "Time Unit" parameter. Based on the "Deviation Type" selection the alarm will behave as described below. For further information please also refer to the paragraph on "Alarm Prototype Settings".

When the alarm is defined as "Exclusive Rate Of Change" type, each intervention threshold will be exclusive, therefore when the "High High" threshold activates the "High" threshold deactivates. When the alarm is defined as "NonExlusive Rate Of Change" type, the intervention threshold will not be exclusive. Therefore when, for example, the "High High" threshold activates so will the "High" threshold. In Runtime the discrimination of an alarm is based on its Status, which is also visible in the "Alarm Window", whether the alarm be exclusive or nonexclusive. When an alarm is Exclusive type, its activation Status will be recorded with the following text:

HighHigh|...
High|...
Low|...
LowLow|...

When an alarm is Non Exclusive, its activation Status will be recorded with the following text:

HighHighActive|...
HighActive|...
LowActive|...
LowLowActive|...

Deviation Type = AbsoluteValue

When the deviation type has an absolute value (Deviation Type = AbsoluteValue), the alarm intervenes only when the Tag value changes with a variation higher than the value set in the time interval samples in the thresholds specified with the "Time Unit". For example, if the four alarm thresholds and the "Time Unit" are set with the following values:

High High Level = 10
High Level = 5
Low Level = -5
Low Low Level = -10

Time Unit = 5 sec

The alarm will go off with the "High Level" intervention threshold when the variable value undergoes a variation of at least a positive of 6 units in the range of 5 seconds. The 5 seconds count starts immediately upon the first Tag variation. As soon as the Tag exceeds the value of the defined threshold the alarm will go off. However, if this threshold value is not exceeded within 5 seconds, the counter will reset and restart upon the next Tag variation. By taking the example setting described above, if the Tag value passes from 30 to 36 in less than 5 seconds, the "High Level" threshold will go off. Analogously, the alarm will go off with the "Low Level" intervention threshold when the variable undergoes a variation of at least 6 negative units, for example if its value passes from 30 to 24 within the range of 5 seconds.
When a Rate of Change alarm is activated, it will remain active even when its value stops changing. At this point, after the "Time Unit" time has elapsed and acknowledged by the user, its state will set to "Inactive".

Deviation Type = PercentOfValue

When the deviation type is set as a percentage of the value (Deviation Type = PercentOfValue) the values set in the thresholds will be considered as percentage values to be applied to the Tag value. The alarm will go (activates) off if the Tag undergoes a variation higher to the Tag's percentage value in the sample time interval specified with the "Time Unit". For example if the four alarm thresholds and the "Time Unit" are set with the following values:

High High Level = 100
High Level = 50
Low Level = -50
Low Low Level = -100

Time Unit = 5 sec

and the current Tag value is 10, this means that the four intervention thresholds will instantly be calculated with the following values:

High High Threshold = 20

High Threshold = 15
Low Threshold = 5
Low Low Threshold = 0

the value is established by taking the percentage rate of the Tag value and then adding it to actual Tab value itself. For example:

High High Threshold = (100% of 10) + 10 = 20
High Threshold = (50% of 10) + 10 = 15
Low Threshold = -(50% of 10) + 10 = 5
Low Low Threshold = -(100% of 10) + 10 = 0

By following the example described above the alarm will go off with the "High Level" intervention threshold when the variable value undergoes a variation of at least 6 positive units within the range of 5 seconds. The 5 second count starts immediately upon the first Tag variation. As soon as the Tab value exceeds the defined threshold value, the alarm will go off. However, if this threshold value is not exceeded within 5 seconds, the counter will reset and restart upon the next Tag variation. By taking the example setting described above into consideration, if the Tag value passes from 10 to 16 in less than 5 seconds, the "High Level" threshold will go off. Analogously, the alarm will go off with the "Low Level" intervention threshold when the variable undergoes a variation of at least 6 negative units, for example if its value passes from 10 to 4 in the range of 5 seconds.

Warning! Each time the Tag changes value, the intervention thresholds will be recalculated based on the new value.

When a Rate of Change alarm is activated, it will remain active even when its value stops changing. At this point, after the "Time Unit" time has elapsed and acknowledged by the user, its state will set to "Inactive".

Deviation Type = PercentOfEURange

When the deviation type is set as a percentage of the EU Range value of the Engineering Unit associated to the Tag (Deviation Type = PercentOfEURange) the values set in the thresholds will be considered as the percentage value to be applied to the UE Range of the Engineering Unit associated to the Tag. The alarm goes off if the Tag variation is higher than the percentage value of the limit differences of UE Range in the time interval sample specified with the "Time Unit". For example, if the four alarm thresholds and the "Time Unit" are set with the following values:

High High Level = 20
High Level = 10
Low Level = -10
Low Low Level = -20

Time Unit = 5 sec

and the Engineering Unit associated to the Tag has the following values:

EU Range Low = -100
EU Range High= 100
Instrument Range Low = -50
Instrument Range High = 50

and the actual value of the Tag is 10, means that the four intervention thresholds will be calculated with the following values:

High High Threshold = 50
High Threshold = 30
Low Threshold = -10
Low Low Threshold = -30

The value is established by taking the percentage of the difference from the minimum and maximum value of the EU Range and then adding it to the same actual Tag value. For example:

High High Threshold = (20% di (100 - (-100))) + 10 = 50
High Threshold = (10% di (100 - (-100))) + 10 = 30
Low Threshold = -(10% di (100 - (-100))) + 10 = -10
Low Low Threshold = -(20% di (100 - (-100))) + 10 = -30

By following the example described above the alarm will go off with the "High Level" intervention threshold when the variable value undergoes a variation of at least 21 positive units within the range of 5 seconds. The 5 second count starts immediately upon the first Tag variation. As soon as the Tab value exceeds the defined threshold value, the alarm will go off. However, if this threshold value is not exceeded within 5 seconds, the counter will reset and restart upon the next Tag variation. By taking the example setting described above into consideration, if the Tag value passes from 10 to 31 in less than 5 seconds, the "High Level" threshold will go off. Analogously, the alarm will go off with the "Low Level" intervention threshold when the variable undergoes a variation of at least 6 negative units, for example if its value passes from 10 to -11 in the range of 5 seconds.

Warning! Each time the Tag changes value, the intervention thresholds will be recalculated based on the new value.

When a Rate of Change alarm is activated, it will remain active even when its value stops changing. At this point, after the "Time Unit" time has elapsed and acknowledged by the user, its state will set to "Inactive".

Deviation Type = PercentOfRange

When the deviation type is set as a percentage of the Instrument Range value of the Engineering Unit associated to the Tag (Deviation Type = PercentOfEURange) the values set in the thresholds will be considered as the percentage value to be applied to the Instrument Range of the Engineering Unit associated to the Tag. The alarm goes off if the Tag variation is higher than the percentage value of the limit differences of Instrument Range in the time interval sample specified with the "Time Unit". For example, if the four alarm thresholds and the "Time Unit" are set with the following values:

High High Level = 20
High Level = 10
Low Level = -10
Low Low Level = -20

Time Unit = 5 sec

and the Engineering Unit associated to the Tag has the following values:

EU Range Low = -100
EU Range High= 100
Instrument Range Low = -50
Instrument Range High = 50

and the actual Tab value is 10, means that the four thresholds will be calculated with the following values at that moment:

High High Threshold = 30
High Threshold = 20
Low Threshold = 0
Low Low Threshold = -10

the value is established by taking the percentage of the difference between the minimum and maximum values of the Instrument Range and adding it to the Tag value. For example:

High High Threshold = (20% di (50 - (-50))) + 10 = 30
High Threshold = (10% di (50 - (-50))) + 10 = 20
Low Threshold = -(10% di (50 - (-50))) + 10 = 0
Low Low Threshold = -(20% di (50 - (-50))) + 10 = -10

By following the example above reported, the alarm will go off with the "High Level" intervention threshold when the variable value undergoes a variation of at least 11 positive units, for example if its value passes from 10 to 21. The alarm will go off with "Low Level" when the variable value undergoes a variation of at least 11 negative units, for example if its value passes from 10 to -1.

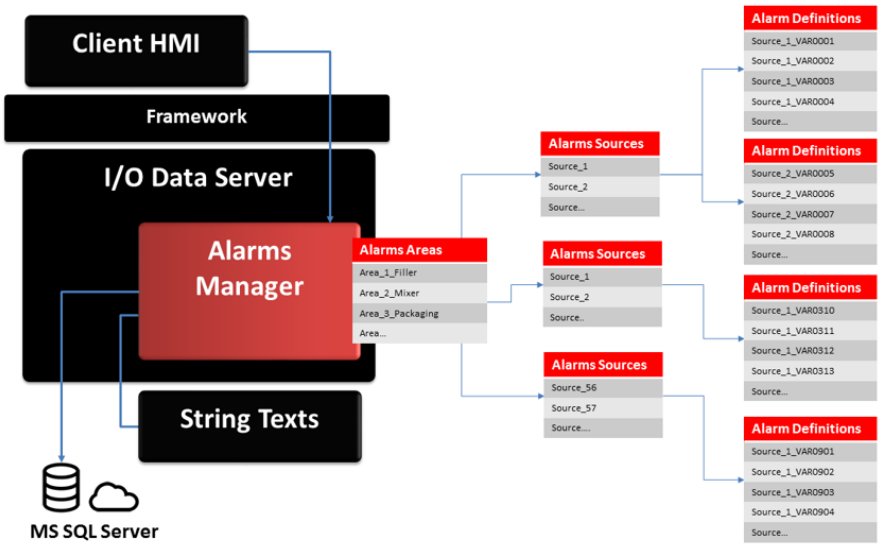
By following the example described above the alarm will go off with the "High Level" intervention threshold when the variable value undergoes a variation of at least 11 positive units within the range of 5 seconds. The 5 second count starts immediately upon the first Tag variation. As soon as the Tab value exceeds the defined threshold value, the alarm will go off. However, if this threshold value is not exceeded within 5 seconds, the counter will reset and restart upon the next Tag variation. By taking the example setting described above into consideration, if the Tag value passes from 10 to 21 in less than 5 seconds, the "High Level" threshold will go off. Analogously, the alarm will go off with the "Low Level" intervention threshold when the variable undergoes a variation of at least 6 negative units, for example if its value passes from 10 to -1 in the range of 5 seconds.

Warning! Each time the Tag changes value, the intervention thresholds will be recalculated based on the new value.

When a Rate of Change alarm is activated, it will remain active even when its value stops changing. At this point, after the "Time Unit" time has elapsed and acknowledged by the user, its state will set to "Inactive".

1.2. Alarm Manager

The Platform.NExT Alarm management provides the use of the **Alarm Server module** which is a **I/O Data Server** component.
The Alarm Server module is used to define and manage the alarms based on the 'Prototype' concept. Alarms can be defined in the I/O Data Server's **"Alarm Prototypes'** card. The diagram below shows how this Alarm concept is used in Platform.NExT:

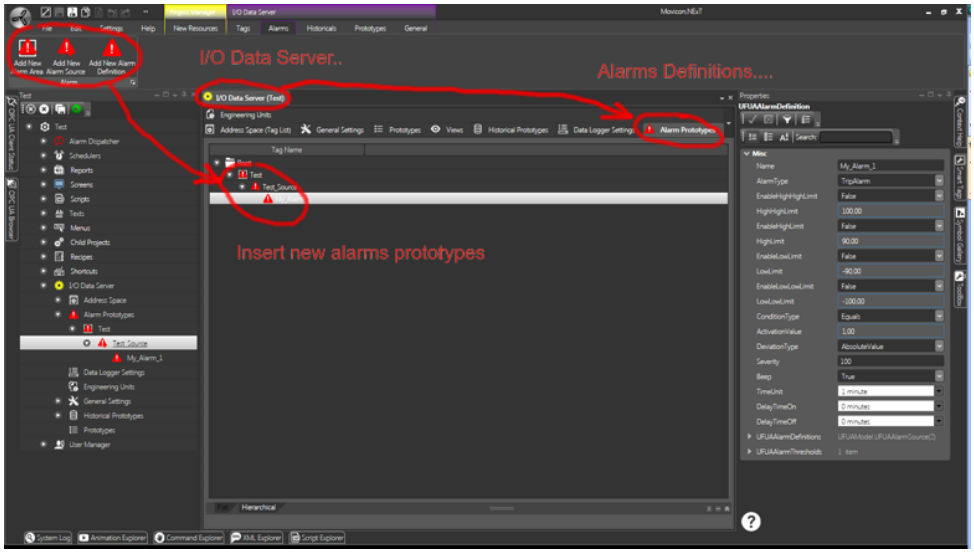


As you can see in the diagram above, the Alarm structure provides the possibility to divided alarms into different **Areas,** which can be defined with different **Sources,** each with its own Alarms.
The alarm is a "Prototype" and therefore can be associated with different tabs. This is very handy for repetitive alarm configurations (e.g. the same "Motor Overload" alarm type for 300 motors each one with its own tag).

the Alarm management in Platform.NExT projects conforms to the OPC UA specifications (standard IEC62541) for Alarm & Conditions typology.

1.3. Alarms_Types

To create a Movicon Alarm object you will first need to create an Alarm Prototype, where the modes and intervention thresholds, to be managed by the alarm, are defined. Once this has been done, the Prototype must then be assigned to a Variable (or to more than one Variable according to the number of alarms of that type to be managed). The value of this variable will be used as a reference for activating the Alarm.



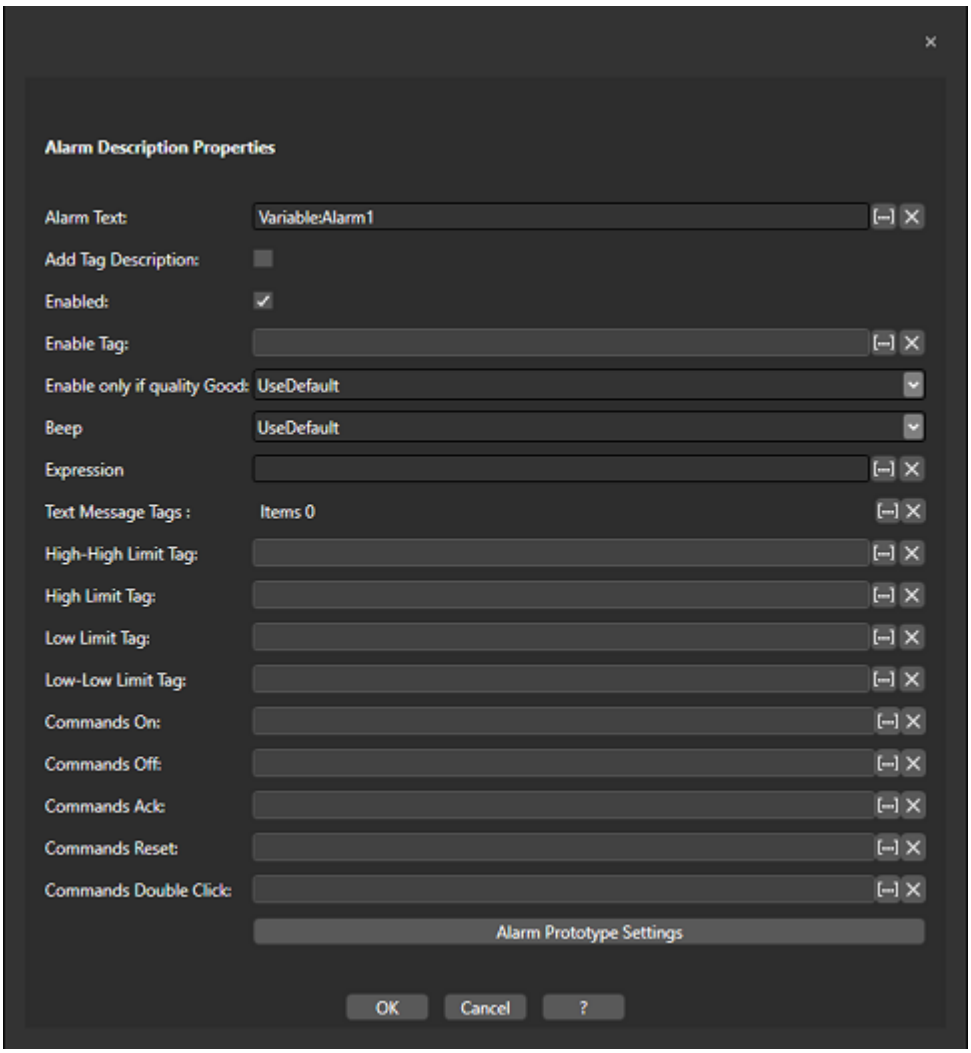
Alarm Typology

An Alarm, according to the OPC UA specifications, can be defined with the following typologies each of which has a different activation mechanism:

- **ExclusiveLevel**
- **NonExclusiveLevel**
- **ExclusiveDeviation**
- **NonExclusiveDeviation**
- **ExclusiveRateOfChenge**
- **NonExclusiveRateOfChenge**
- **TripAlarm**

1.4. Alarm Threshold Properties

The Alarm threshold object can be configured by means of its properties. It is also possible to use these properties to set different parameters for each individual alarm when using the same alarm prototype. In order to open the configuration window of an alarm threshold simply double click on the actual threshold or after having selected it (Address Space) open the Properties Window and modify the parameters.



A alarm threshold property window.

The property parameters of an alarm threshold are:

Alarm Text

The text to be shown as the alarm's text is inserted in this field. This text will be displayed in the Alarm Window and will be saved in the project's Historical Log. In cases where this field is left empty, the alarm text will be composed by the name of the Tag followed by the name of the alarm (eg. TagName:AlarmPrototypeName). When a custom text is inserted in this field, it will be displayed within brackets at the side of the alarm threshold's name in the Address Space window.

A static text and a String ID can be inserted in the "Alarm Text" field for managing language changes.
When performing a project language change, the alarm texts already displayed in the Alarm Window will be refreshed with the current language or refreshed by using the Alarm Window's Refresh command or by reloading the Screen.

Add Tag Description

When this option is selected, the Tag Description will be used as the alarm's text. This function may be very handy when importing Tags from the field devices (e.g. PLC) tag

list. The importer also imports by device tag description if any are used to identify the alarm type.

Enabled

This check-box is used for enabling or disabling the alarm in question.

Enable Tag

This field is used for selecting a project Tag based on which the alarm is disabled or enabled during Runtime. The alarm is disabled when the Tag is set with the zero value and enabled when the Tag is set with another value that is not zero.

Activation Tag Value

This edit box is used to insert (or select with the "..." browse button on the right) the name of the variable whose value will be used instead of the one defined in the Alarm Prototype's **"Activation Value"** property. This will make the threshold value dynamic so that the variable contents can be modified during Runtime.
When this field is left empty, the contents of the Alarm Prototype's "Activation Value" property will be considered as the fixed threshold.
When a Trip alarm type is selected, only one "Activation Tag Value" field will show.
When other alarm types are selected, four different "Activation Tag Value" type fields will show, one for each threshold intervention (High-High Limit Tag, High Limit Tag, Low Limit Tag, Low-Low Limit Tag).

Alias Tag List

One or more variables can be inserted in this field and whose value will be displayed at runtime in the alarm text. The placeholder must be inserted in the alarm text to then be replaced by the Tag's value. The placeholder is defined by the number of tag's position in the Tag list shown within brackets (e.g. {0}). For example if the following text is inserted in the 'Alarm Text' property like so:

Alarm 1 Active. Minimum value = {0}, maximum value = {1}.

The two “TagValMin” and “TagValMax” tags are inserted in the Alias Tag List respectively. When the alarm activates in runtime, the placeholder in the text that appears in the Alarm will be replaced by the “TagValMin” tag's value and placeholder {1} will be replaced by the “TagValMax” tag's value .

If a 'String ID' is inserted in the 'Alarm Text' property, any placeholders should to be inserted in the strings of the string table for each defined language.

Enable only if quality is good

This is used to enable/disable the alarm management based on the recording quality. When the variable's quality is not 'good', the alarm will not be managed.

Beep

This option is used for setting the alarm beep sound when activated or not. The options are:

- **UseDefault**: selecting this mode the alarm sound will be inherited from the analogic setting in the Alarm Prototype with which the threshold was defined with.
- **ForseTrue**: selecting this mode the alarm sound will be executed independently from the analogic setting in the Alarm Prototype with which the threshold was defined with.

- **ForceFalse**: selecting this mode the alarm sound will not be executed independently from the analogic setting in the Alarm Prototype with which the threshold was defined with.

Expression

This entry field is used for inserting an expression to enable access to the Tag bit or Array element. For example, the alarm Tag may be a Word type, whereby every single bit corresponds to one single alarm, or an Array type with elements corresponding to different alarms.

The syntax used for accessing the Tag bit is <.BitNum>. For example, inserting ".1" in this field means that the alarm will be controlled according to the status of the associated Tag Bit 1. In order to manage more than one alarm bit in the same Tag you will need to assign the same number of alarm templates as there are bits to be managed to the Tag and then specify each of these alarm templates with one of these bits. For example to manage 16 bit of a word you will have to assign 16 alarm templates to the Tag and then assign a different bit in each threshold specified in the Expression. The syntax for accessing an Array Tag element is <[element]>. For example when inserting "[1]" in the field, the alarm will be controlled according to the status of the Array Tag's 1 element. The elements are numbered starting with zero, therefore an Array of 5 elements will be numbered from 0 to 4.

It is also possible to insert an expression to extrapolate a value based on the Tag value associated to the alarm. These expressions must have a syntax like the one used in expressions in objects (see "Expressions in Objects"). An example of this syntax type could be:

= = SQRT([x])

where the [x] parameter will be replaced with the value of the Tag associated to the alarm. In this case, the alarm's activation value will therefore be the square root of the Tag's value.

Commands On

This property is used to associate commands to the alarm threshold to execute when "ON"

Commands Off

This property is used to associate commands to the alarm threshold to execute when "OFF"

Commands Ack

This property is used to associate commands to the alarm threshold to execute when Acknowledged.

Commands Reset

This property is used to associate some commands to the alarm threshold to execute when reset..

Commands Double Click

This property is used to associate commands to your alarm threshold to execute when double clicked within the alarm window.

Attention! The commands currently function only when server and client have both been started up. These commands won't function with the -start -client option.

Alarm Prototype Settings

This button is used for opening the Alarm Prototype's setting window with which the threshold was defined.

1.5. Alarm Prototype Settings

An alarm prototype is defined with a structure that mainly consists of three levels: "Alarm Area", "Alarm Source" and "Alarm Definition". The Alarm Area is used to specify an area belonging to the alarm where different alarm groups can be managed. One or more "Alarm Sources" as well as other "Alarm Areas" can be inserted within the one same "Alarm Area". One or more "Alarm Definitions" can be inserted within one "Alarm Source". The Source is also used to subdivide alarms and set the number of Branches to be displayed for the Source in the Alarm Window.
The "Alarm Definition" represents the alarm object itself along with various properties which can be set to determine how the alarm functions. When a new alarm definition is inserted, a settings window opens through which different alarm function parameters can be set. Some of these parameters are available for all alarm types, while others are more specific and therefore are displayed according to the selected "Alarm Type":

Alarm Area

The Alarm Area properties are:

Name
The name of the Alarm Area is entered in this field. The name must be unique within the list.

Alarm Source

The Alarm Source properties are:

Name
The name of the alarm source is entered in this field. The name must be unique within the same area.

Alarm Definition

The Alarm Definition properties are:

Name
The name of the alarm prototype is entered in this field. This name must be unique within the same Source.

Alarm Type
This field is used for selecting the alarm type with which to define the prototype. The alarm options are:

- **ExclusiveLevel**
- **NonExclusiveLevel**
- **ExclusiveDeviation**
- **NonExclusiveDeviation**
- **ExclusiveRateOfChange**
- **NonExclusiveRateOfChange**
- **TripAlarm**

The configuration parameters will display according to the selected alarm type option.

Enable only if quality is good

This is used to enable/disable the alarm management based on the recording quality. When the variable's quality is not 'good', the alarm will not be managed in any which way whatever.

Enable Log

This option is used for enabling the Historical Log to record alarms or messages when the relative events occur (ON, OFF, ACK, RESET). These recordings will be kept in the project's "UFUAAuditLogItem" database table created by Movicon.

Enable Branch History

This option is used for enabling an alarm's branch management. For further information on displaying Branches please refer to "Branch Allarmi".

Support ACK

This option is used for enabling the alarm ACK function. When the 'Support ACK' option is enabled and the 'Support Reset' is disabled, the alarm will vanish from the Alarm Window once acknowledged and its activation condition no longer verifiable.

Support Reset

This option is used for enabling the alarm RESET function. When the 'Support Reset' option is enabled and the 'Support Ack' is disabled, the alarm will not be acknowledged but only reset once its activation condition is no longer verifiable.

Beep

Select this check box if the PC where I/O Data Server is running must emit a Beep, using the system's buzzer, when the alarm activates. This parameter is an alarm prototype default value that can be changed for each individual "Alarm Threshold" created with the same prototype. Each 'Alarm Threshold' has its own 'Beep' property that is inherited from the prototype that can nevertheless be changed.

Play Sound File

It is possible to specify the wav audio file to be played by the PC, where the O/I Data server is running, when the alarm activates. In cases where there are several alarms in use, the file linked to the alarm with the highest severity will be played.

Play Sound Continuously

When checked, this property will play the wav audio file defined in the 'Play Sound File' in a continuous loop.

Activation Condition

This selection field is only available when the TripAlarm alarm type has been selected. This represents the condition type with which the alarm must be activated in relation to the specified "Activation Value" value. The selection options are:

- **Equals**
- **GreaterThen**
- **LessThen**
- **GreaterThanOrEqual**
- **LessThenOrEqual**
- **NoEqual**

Activation Value

This selection field is only available when the TripAlarm alarm type has been selected. This represents the reference value to which the alarm must activated according to the "Activation Condition".

Severity

This parameter is used for specifying a severity level for the alarm. The severity is a field which is dsplayed in the Alarm Window and recorded in the Historical Log.

Beep

When this option is enabled, the alarm in question will sound upon activation. This option is a prototype default value and can be changed for each individual "Alarm Threshold" created with the same prototype. Each 'Alarm Threshold' can in fact have its own "Beep" property either by inheriting it from the alarm prototype or with a fixed setting.

Delay Time On

This parameter is used for delaying the alarm's activation. In this case, when setting a value other than zero, in order to activate the alarm, the alarm condition will have to persist the duration of the time set otherwise no alarm event will be generated. This parameter is usually used in those conditions where the Tag value may undergo undesired oscillations that need to be filtered out before a true alarm event can be established.

Delay Time Off

This parameter is used for delaying the alarm's deactivation. In this case, when a value other than zero is specified, in order to deactivate the alarm, the alarm condition will not have to persist the duration of the set time otherwise the alarm will remain active. This parameter is usually used in those conditions where the Tag value may undergo undesired oscillations that need to be filtered out before a true alarm event can be established.

The Off time is only used for deactivating the alarm. The On time is always used for changing thresholds such as from HighHigh to High for instance.

Deviation Type

This selection field is only available when either one of the ExclusiveDeviation, NonExclusiveDeviation, ExclusiveRateOfChange o NonExclusiveRateOfChange alarm types is selected. This represents the type of deviation that must be used for activating the alarm. This parameter, combined with the set threshold values, calculates the alarm's activation values. The selection options are:

- **AbsoluteValue**
- **PercentOfRange**
- **PercentOfValue**
- **PercentOfUURange**

For further details on these parameters please refer to the paragraphs which describe how the different alarm types function: ExclusiveDeviation, NonExclusiveDeviation, ExclusiveRateOfChange and NonExclusiveRateOfChange.

High High Level (Enable)

This check box is used for enabling the "High High Level" alarm's intervention threshold. Once the threshold has been enabled it will be possible to enter the activation value by means of using the appropriate "High High Level (Value)" field.

High High Level (Value)

This entry field becomes available only when either one of the ExclusiveLevel, NonExclusiveLevel, ExclusiveDeviation, NonExclusiveDeviation, ExclusiveRateOfChange or NonExclusiveRateOfChange has been selected and when the threshold has been enabled by means of using the "High High Level (Enable)" property. This parameter is used for calculating the "High High" threshold value for alarm activation. The value entered in this filed is used if different modes according to the selected "Alarm Type" and any eventual "Deviation Type". For further details on these parameters please refer to the paragraphs which describe how the different alarm types function: ExclusiveLevel, NonExclusiveLevel, ExclusiveDeviation, NonExclusiveDeviation, ExclusiveRateOfChange e NonExclusiveRateOfChange.

The usage of the "HighHigh" threshold can be disabled by using the appropriate Check-Box.

High Level (Enable)

This check box is used for enabling the "High Level" alarm's intervention threshold. Once this threshold has been enalbed it will be possible to enter the activation value using the appropriate "High Level (Value)" field.

High Level (Value)

This entry field is made available only when either one of the ExclusiveLevel, NonExclusiveLevel, ExclusiveDeviation, NonExclusiveDeviation, ExclusiveRateOfChange or NonExclusiveRateOfChange alarm types are selected and when the threshold has been enabled using the appropriate "High Level (Enable)" field. This parameter is used for calculating the "High" threshold value for alarm activation. the value entered in this filed is used if different modes according to the selected "Alarm Type" and any eventual "Deviation Type". For further details on these parameters please refer to the paragraphs which describe how the different alarm types function: ExclusiveLevel, NonExclusiveLevel, ExclusiveDeviation, NonExclusiveDeviation, ExclusiveRateOfChange e NonExclusiveRateOfChange.

The usage of the "High" threshold can be disabled by using the appropriate Check-Box.

Low Level (Enable)

This check box is used for enabling the "Low Level" alarm's intervention threshold. Once this threshold has been enabled it will be possible to insert the activation value using the appropriate "Low Level (Value)" field.

Low Level (Value)

This entry field is only made available when either one of the ExclusiveLevel, NonExclusiveLevel, ExclusiveDeviation, NonExclusiveDeviation, ExclusiveRateOfChange or NonExclusiveRateOfChange alarm types are selected along with enabling the threshold using the "Low Level (Enable)" property. This parameter is used for calculating the "Low" threshold value for alarm activation. the value entered in this filed is used if different modes according to the selected "Alarm Type" and any eventual "Deviation Type". For further details on these parameters please refer to the paragraphs which describe how the different alarm types function: ExclusiveLevel, NonExclusiveLevel, ExclusiveDeviation, NonExclusiveDeviation, ExclusiveRateOfChange e NonExclusiveRateOfChange.

The usage of the "Low" threshold can be disabled by using the appropriate Check-Box.

Low Low Level (Enable)

This check box is used for enabling the "Low Low Level" alarm's intervention threshold. Once this threshold has been enabled it will be possible to insert the activation value using the appropriate "Low Low Level (Value)" field.

Low Low Level (Value)

This entry field is only made available when either one of the ExclusiveLevel, NonExclusiveLevel, ExclusiveDeviation, NonExclusiveDeviation, ExclusiveRateOfChange or NonExclusiveRateOfChange alarm types are selected, along with enabling the threshold using the "Low Low Level (Enable)" property. This parameter is used for calculating the "Low Low" threshold value for alarm activation. The value entered in this filed is used if different modes according to the selected "Alarm Type" and any eventual "Deviation Type". For further details on these parameters please refer to the paragraphs which describe how the different alarm types function: ExclusiveLevel, NonExclusiveLevel, ExclusiveDeviation, NonExclusiveDeviation, ExclusiveRateOfChange e NonExclusiveRateOfChange.

The usage of the "Low Low" threshold can be disabled by using the appropriate Check-Box.

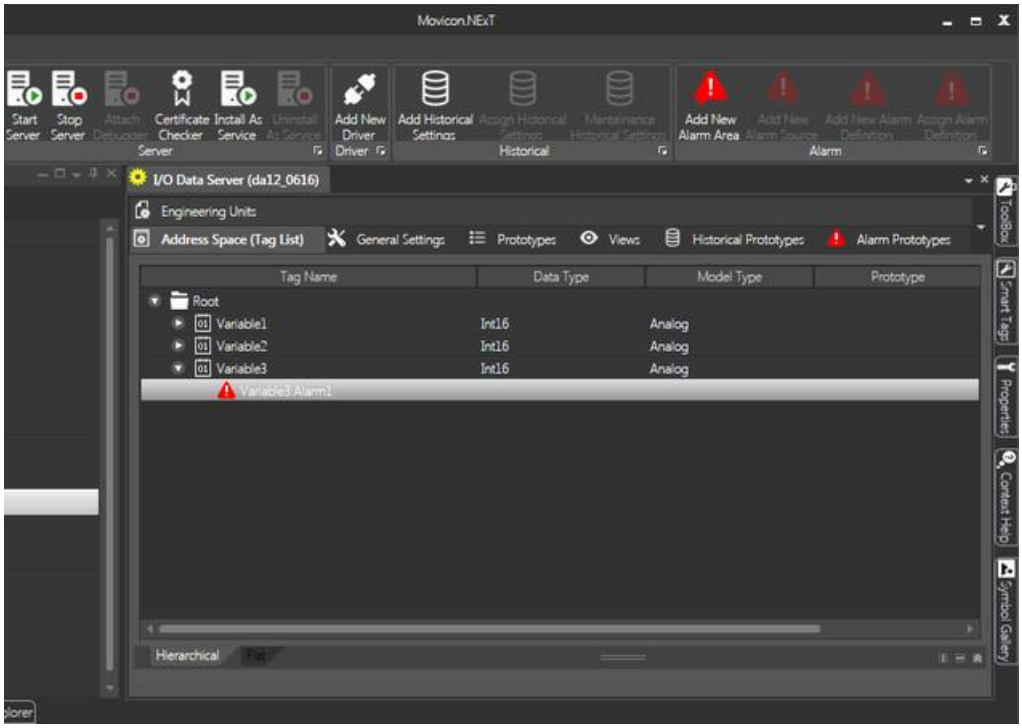
Time Unit

This selection field is only available when an ExclusiveRateOfChange or NonExclusiveRateOfChange alarm type is selected. This parameter is used as a sample time range. When the Tag variation reaches higher than the set value within this time range the alarm will be activated. For further details on this parameter please refer to the paragraphs which describe how the different alarm types function: ExclusiveRateOfChange and NonExclusiveRateOfChange.

1.6. Assigning tags to Alarms

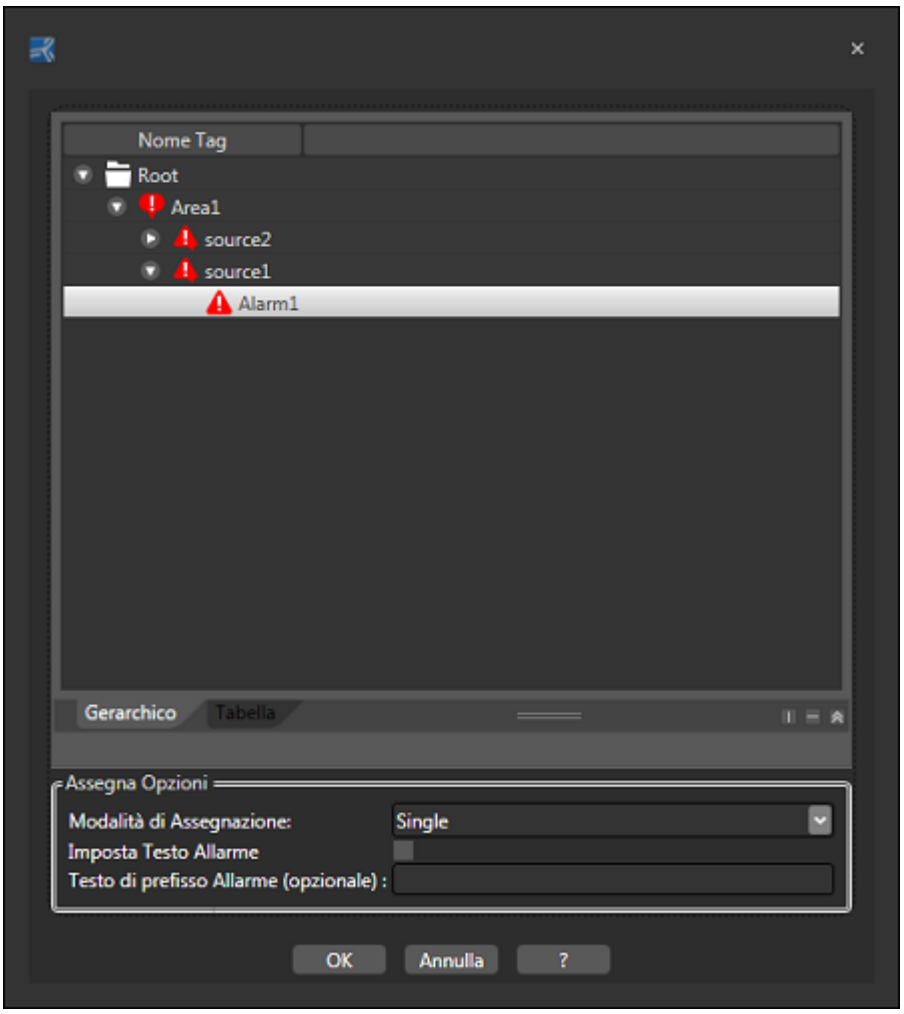
After having defined and configured Alarm Prototype objects you will need to assign variables for activating the alarms. This operation can be done by simply opening project's **"Address Space"** from the "I/O Data Server" group with a double click on the Project Window to display the list of project variables within the WorkSpace. At this point select a Variable and activate the "Assign Alarm Definition" command from the "I/O Data Server Editor- Alarm" ribbon. This command will open a dialog window with the list of defined alarm prototypes. Select the desired prototype and confirm with OK.

Once confirmed the Variable will appear with a "+" symbol on the left. Clicking on this "+" symbol will open the Variable's tree structure showing the Alarm Threshold object it has been associated to.



The threshold of the Alarm associated to a Variable can be displayed by clicking on the "+" symbol at the side of the variable.

Different modes can be used to associate an alarm to a tag.
The window used for creating this association is opened from the contextual menu which appears when right clicking on the variable.
At the bottom of this window you will find a window containing the "Assign Options" .



The values which can be selected are:

- **"Single"**: the alarm is associated to the entire variable
- **"AnyTagElement":** the alarm is associated to any array variable type element in cases of a var ArrayByte (N elements)
  1 expression threshold = [0]
  ...
  Last expression threshold = [N-1]
- **"AnyTagBit":** The alarm is associated to each variable bit whether the variable be an array variable or a simple variable. EXAMPLE:
  8 alarm association thresholds are created for byte type variables by redefining the expression
  1 expression threshold = .0
  2 expression threshold = .1
  3 expression threshold = .2
  4 expression threshold = .3
  5 expression threshold = .4
  6 expression threshold = .5
  7 expression threshold = .6
  8 expression threshold = .7
  In cases of a var. ArrayByte (N elements)
  [0].0
  ...
  [0].7 (7=number of bits of the single array-1 element)
  ....

[N-1].0
...
[N-1].7

The "Set Alarm Text" check box allows you to set a text to associate to the alarm as a prefix. This text will be completed with a progressive suffix number ".number", according to the element which the alarm has been associate to.
The text is created in the "Alarm Text" field of the alarm threshold in the variable associated to the alarm.
The text is not added automatically to the string table. However a new command has been added to the server's editor to enable you to add the missing string ID to the string table.
This command is represented by the "Add String Id" button in the following cards: general, address space and prototypes.
It behaves differently according to the card invoked:

- **General->Add String Id** : Adds all the necessary text of those alarms that have been declared in the address space or in the prototype members.
- **Address Space->Add String Id** : Adds the alarm text for the objects that have been selected. If no objects have been selected, it adds alarm text for all of the alarms defined in the variable.
- **Prototypes->Add String Id** : Adds alarm text for the objects that have been selected. If no objects have been selected, it adds alarm text for all of the alarms defined in the prototype members.

The Alarm Threshold object's properties can be configured so that each alarm has different parameters.

1.7. Viewing Active Alarms

During the Project Runtime phase the active alarms can be viewed through the "Alarm Viewer" object or the "Alarm Banner" object on screen.

The Server module in your machine will automatically connect to Alarm Viewers inserted on screens.
However, it is also possible to connect the "Alarm Viewer" to a different Server module to the one already in use the running project, for example, to retrieve alarms from one network Server to another project or third party. To achieve this simply specify the Alarm Viewer's reference Server by using the "OPC UA Browser" window in the desired Server and drag the Server onto the Alarm Viewer.

Alarm Viewer Object

The Alarm Viewer object, available from the Toolbox, is used for listing active project alarms. In addition to viewing alarms the Alarm Viewer can be used for performing other operations by using the buttons described below:

- **ACK:** acknowledges alarm. This event is recorded in the Historical Log table's "Details" column with the "The alarm was acknowledged" message
- **Reset:** resets alarm. This event is recorded in the Historical Log table's "Details" column with the “The alarm was confirmed” message

- **Shelve:** delays alarm activation. The delay time is inserted in the entry field at the side of the button in the "D.hh:mm:ss" format. This event is inserted in the historical log table "Details" column with the "The alarm was shelved" message
- **Unshelve:** the alarm activation delay is suspended. This event is inserted in the historical log table "Details" column as "The alarm was unshelved"
- **Shelve Time**: the shelve time is specified in this field. The time entered in the field will be taken into consideration when an alarm is shelved. Once this time has expired the alarm will be reactivated. Time must be entered in Days, hours, minutes and seconds.
- **Ack All:** acknowledges all the active alarms in the window
- **Reset All:** resets all the active alarms in the window
- **Refresh:** refreshes the window's alarm list
- **Add Comment**: this command opens a dialog window in which it is possible to insert a comment to associate to the selected alarm. This comment will be saved in the alarm's persistence file and then displayed in the Alarm Windows "Comment" column each time the alarm is activated. In addition, this comment will also be recorded in the Historical Log table in the relevant "Comment" column and then displayed in the Historical Log window's "Comment" column. In this case the comment will be shown for all the alarm's different recorded states (active, inactive, acknowledge, confirmed, etc.)
- **Disable Sound**: when managed as a toggle, this button is used for enabling or disabling the alarm sound. This command is linked to the "AlarmSoundState" Server's system variable. Therefore the alarm sound can be toggled directly in this variable ("AlarmSoundState" = True: enables sound, "AlarmSoundState" = False: disables sound). The AlarmSoundState tag's persistence information is recorded in the IsolatedStorage and therefore is UserBased information. If the Windows user is changed, it will also be possible to save the sound state in a different mode.

When the Alarm Viewer Object is used by the **"Web Client HTML5",** only the "Ack All", "Reset All" and "Refresh" buttons are available for use but not the "Search" tool, scroll bars, column resizer and filter with clauses even though they are still visible.

The data displayed in columns in the Alarm Viewer are:

- **Branch**: indicates alarm occurrences stating whether event is an active event or past event. For further information on displaying Branches please refer to the paragraph on "Alarms Branch".
- **Message**: shows the alarm's text
- **Comment**: shows any comments associated to the alarm
- **Source**: shows the name of the Area and Source belonging to the alarm
- **State**: shows the alarm's status. This information is divided into two parts, the first part defines whether the cause of the alarm is 'Active' or 'Inactive', while the second part shows the which action is still to be performed: 'Unacknowledged', Unconfirmed'. For example, an active alarm has not yet been acknowledged and will show as "Active | Unacknowledged" state. On the other hand, an inactive and an already acknowledged and reset alarm will show with the 'Inactive' state. To eliminate the 'Inactive' state messages from window simply use the Refresh command.
- **Condition**: shows the name of the alarm's activation variable
- **Severity**: shows the alarm's severity
- **Time**: shows the date and time of the alarm event

1.8. Alarm Branch

The activation of the Alarm Branch management using the"Enable Branch History" property will display the transaction events from ON to OFF in the Alarm Window during runtime. In addition to the Alarm's active event identified as "Active Branch" in the Alarm Window, a new event will be entered when the alarm switches from the ON state (Active) to the OFF state (inactive), but the date and time reported in the Branch will refer to that of the alarm's activation. Therefore the list of alarms reported in the window can be quickly checked through to see how many times and what time the alarm activated. In the Alarm Window's 'Comment' column a message is displayed with the progressive Branch numbers.
To delete a Branch from the Alarm Window simply acknowledge the event (ACK). Even though the alarm, being the active event, is acknowledged because its status has changed to inactive (OFF), it will remain displayed if it has other Branches yet to be acknowledged.

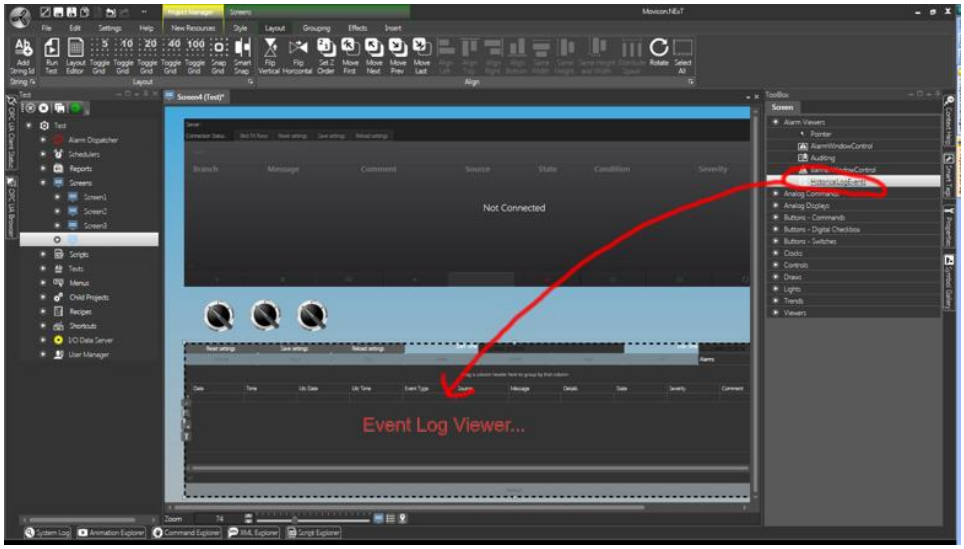
2. Historical log and Events

2.1.1. Historical Log Visualization

During the Project Runtime phase, you can view Alarms and Events recorded on Data Base by the Alarm Manager during runtime. The Historical Log events can be viewed using the "Event Logger Viewer" object which can be taken from the Toolbox and inserted on Screen.

To insert a Event Log viewer object proceed as follows:

1. Open a Screen in the Movicon workspace.
2. Activate the Toolbox and select the "**Alarm Viewers**" object group click on the icon to expand group.
3. Select the **"Event Logger Viewer"** object.
4. Drag and drop the selected object to a position on screen. To make it simple, we will insert this viewer in the same screen where we previously inserted the Alarm Viewer as shown below:



The Event Logger Viewer object displays the Alarms and events recorded during runtime on the project's DB.

After having inserted the Event Logger Viewer object on screen, you can size and configure its style as needed by using its properties window.

Historical Log viewer provides three tables as previously described for: Alarms, Events, Drivers and System Events. All of them can be viewed by the user in runtime time by applying filters or one of the three tables can be forced to display data for viewing. For example, if you want to view the Alarm Log only, use the appropriate property from the object's properties window that enables this to happen.

The Viewer's Refresh command forces access to the DB to refresh the displayed historical data.
In addition, you can use the appropriate viewer object command for applying filters and order bys of recorded data.

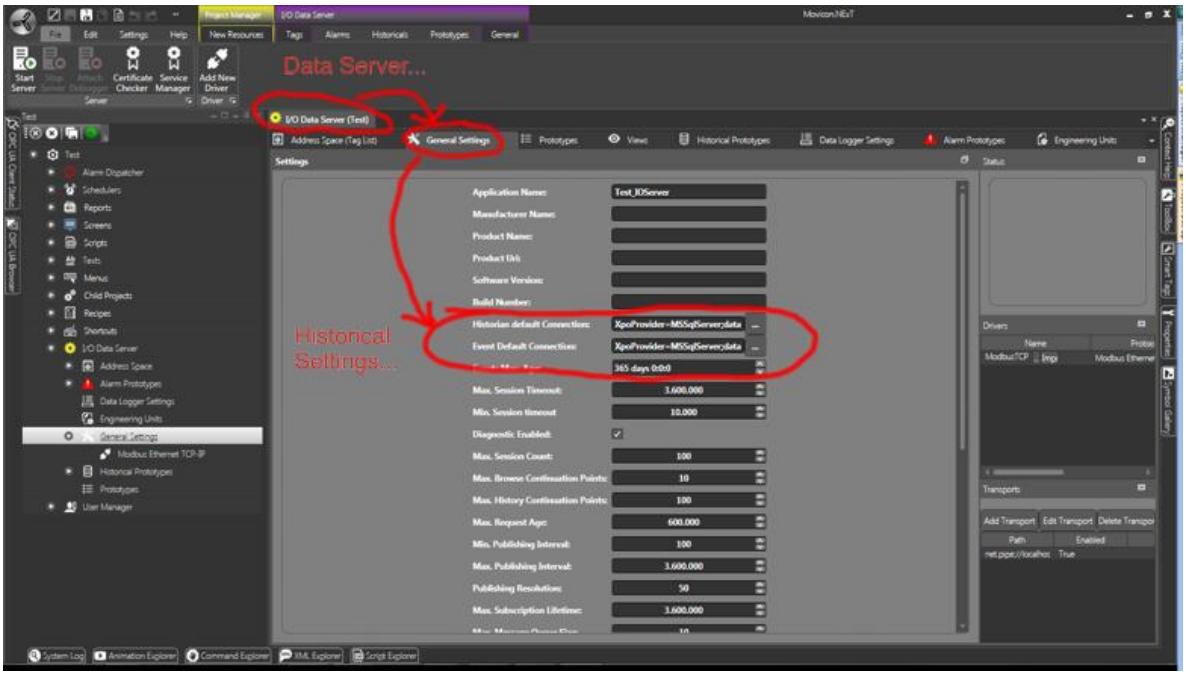
2.1.2. Event Historical Log

The Platform.NExT I/O Data Server's **Alarm Manager** module automatically records all events on the historical log definable as database files in the 'I/O Data Server's **General Settings**.
The events that the Alarm Manager module records and stored on log files are:

1. Alarms: All the alarms or messages defined as Project Alarms
2. Drivers: All the system events relating to the I/O communication drivers inserted in the project.
3. System: All the system events generated by the platform during project runtime

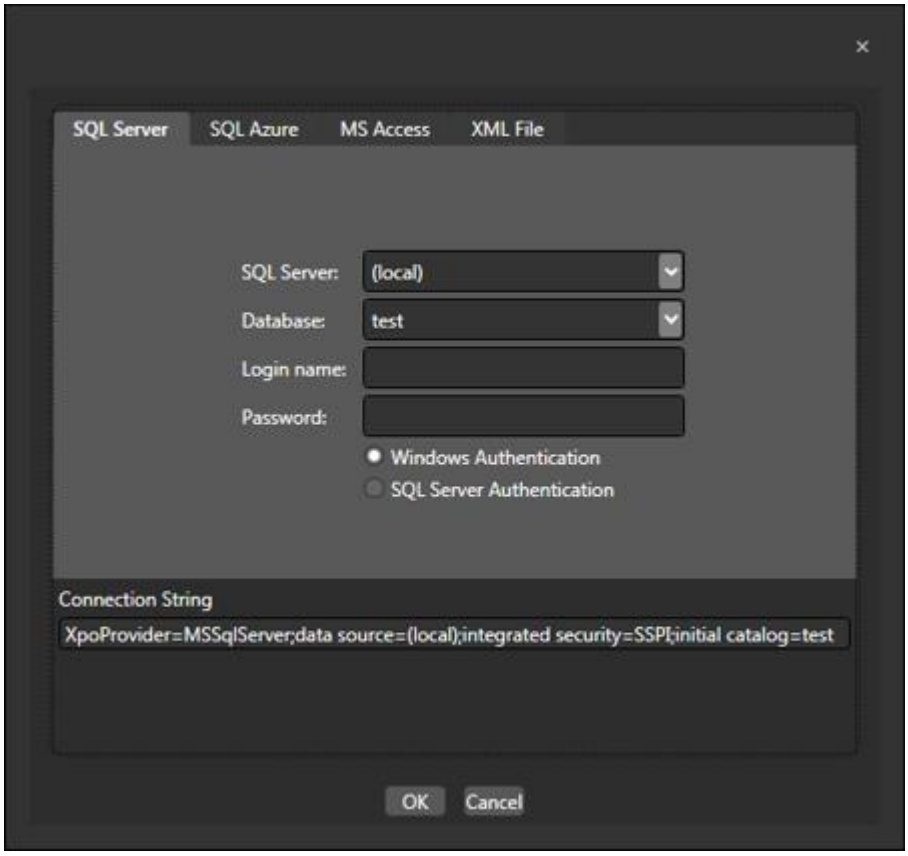
The data archive is defined using the connection string towards the database, as indicated below:

1. Start Platform.NExT and open the project's **I/O Data Server** resource.
2. From the Data Server, access "**General Settings**" using the corresponding tab or project tree structure
3. Find the "**Event Default Connection**" property and open the settings window using the [...] button on the right.



4. Set the Database and access parameter. For example, you can use the installed SQL Server version and keep Windows authentication. The database table can be selected

from those already existing or you can enter the name of the one desired in the "Database" field which will then be created by the system.



Confirm the operation to create the **Connection String** towards the Historical Log database. In this way during project runtime, all the events will be recorded on DB files.

Please note that the General Settings section can be used for defining the maximum archive life cycle expressed in days (365 days for default) in addition to setting the connection string to the DB.
Once this number of days has been reached, the system will recycle by overwriting the oldest data.

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