



Hyper Historian

Performance Calculations and Functions



APPLICATION NOTE

August 2014

Description: The Hyper Historian provides an extensive set of native mathematical functions to allow the user to implement specific calculations for their application. Furthermore it also provides the means to create user defined functions, which can be used with individual parameters to accommodate for reusability.

Introduction

One of the key features of the Hyper Historian is the ability to not only log values, but its ability to then further process these values as aggregates and fully user-definable performance calculations.

This application note shows how performance calculations can be used to calculate typically required information for an emission monitoring system, including:

- Logging of the raw data value
- Determine the maximum in each hour
- Determine the average over each hourly period
- The number of exceptions in each hour
- The duration that the raw value was above the exception limit in each hour

In this example only one raw data tag is set up, but it would be typical for an emission monitoring system to have many elements or compounds measured in the emissions. Although performance calculations can be defined without the use of calculation functions, this application notes shows the use of calculations functions as an example of best practice for reusable development.

Raw Data Value

Before any aggregates or performance calculations can be added a raw data value has to be logged.

1. Open the Workbench
2. Select the Hyper Historian provider
3. Expand and select **localhost** → **HyperHistorian** → **Data Collections**
4. Select **Add** → **Folder** from the Home Ribbon
5. Enter **Emissions** as the name of the folder and click on Apply
6. Select the **Emissions** folder
7. Select **Add** → **Tag** from the Home Ribbon
8. Set the name of the Tag to **Dust**
9. Select an appropriate Source Signal or use the following simulation value: **svrsim:ramp float 0 8**

10. Set the Engineering Units to mg/Nm3
11. Set the Low and High Limit to **0** and **10** respectively
12. Click the 'Update Ranges' button, click on Apply and exit the Dust tab

Aggregate Values

With the raw data value being logged, the aggregates can now be defined.

1. In the Hyper Historian provider, expand and select **localhost** → **[Database Name]** → **Groups** → **Logging Group** → **Aggregation**
2. Select **Add** → **Aggregate Group** from the Home Ribbon
3. Set the Name to **AggregateHourly**
4. Set the Period to **1 Hour**
5. Set the Percent Good to **80%**
6. Check **Treat Uncertain as Bad** and click on Apply
7. Expand and double-click **localhost** → **[Database Name]** → **Data Collections** → **Emissions** → **Dust**
8. Select the Tag Aggregates tab
9. On the first row select **AggregateHourly** in the Aggregate Group column
10. Set the Aggregate Type to **Maximum**
11. Check the **Enabled** column
12. On the second row select **AggregateHourly** in the Aggregate Group column
13. Set the Aggregate Type to **Time Average**
14. Check the **Enabled** column and click Apply

Calculation Triggers

Calculation triggers determine how frequently a calculated tag will be calculated. With the raw data value being logged the calculation triggers can now be defined.

1. In the Hyper Historian provider, expand and select **localhost** → **[Database Name]** → **Calculation Triggers**
2. Select **Add** → **Trigger Folder** from the Home Ribbon
3. Enter **Emissions** as the name of the folder and click Apply
4. Select the **Emissions** folder
5. Select **Add** → **Data Trigger** from the Home Ribbon
6. Set the name of the Trigger to **Dust**
7. Check the **Enabled** flag
8. Set the Trigger On to **Expression**
9. Click on the Variables button and under Data Collections, browse to and select the Dust tag. Click OK.
10. The expression is now **{{data:LogGrp.Emissions.Dust}}**. Edit it to be **{{data:LogGrp.Emissions.Dust}} > 5** and click on Apply.



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Calculation Functions

Rather than explicitly defining the same function for multiple tags and just changing the input tag name, it is better to create a generic calculation function which can be used over and over again.

1. In the Hyper Historian provider, expand and select **localhost** → **[Database Name]** → **Calculation Functions**
2. Select **Add** → **Calculation Folder** from the Home Ribbon
3. Enter **Emissions** as the name of the folder and click on Apply
4. Select the **Emissions** folder
5. Right-click and add **Calculation Function**
6. Set both the name and the short description of the Function to **ExceptionCount**
7. Check the **Enabled** checkbox
8. Set the Returns value to **DataValue, a set of Timestamp, Value and Quality code**
9. There are no parameters, so leave this section blank.
10. On the Expression tab, set the Expression to:
IF (trgnamecur() == "1h" || isbad(calcprev()))
THEN 0
ELSE calcprev() + 1
and click on Apply

The first calculation function has now been defined, and will be triggered when the value of a measured element or compound exceeds the limit defined in the trigger for that element or compound. Continue to add the second calculation function.

11. Select the **Emissions** folder
12. Right-click and add **Calculation Function**
13. Set both the name and the short description of the Function to **ExceptionDuration**
14. Check the **Enabled** flag
15. Set the Returns value to **DataValue, a set of Timestamp, Value and Quality code**
16. Add three Parameters named:
 - a. variable
 - b. threshold
 - c. duration
17. On the Expression tab, set the Expression to
totalseconds(tagtime({{par:variable}}, now() –
fromseconds({{par:duration}}), now(), ">",
{{par:threshold}}, 0))
and click on Apply

The second calculation function has now been defined, and will only be triggered on a periodic basis to work out the actual

duration. This function uses parameters to ensure that the same function can be used for all elements and compounds.

Performance Calculation Tags

With the raw data tag, the calculation triggers, and the calculation functions in place, the two performance calculation tags can now be defined.

To add the first performance calculation tag:

1. In the Hyper Historian provider, expand and select **localhost** → **[Database Name]** → **Data Collections** → **Logging Group** → **Emissions**
2. Select **Add** → **Folder** from the Home Ribbon
3. Enter **ExceptionCount** as the name of the folder and click on Apply
4. Select the **ExceptionCount** folder
5. Right-click and add **Calculated Tag**
6. Set the name of the Tag to **Dust**
7. In triggers, add the **Periodic\1hr** time trigger with the name **1h**
8. Add the **Emissions\Dust** data trigger with the name **Dust**
9. Switch to the Expressions tab
10. Set the expression to:
\$Emissions.ExceptionCount() and click Apply

To add the second performance calculation tag:

11. In the Hyper Historian provider, expand and select **localhost** → **[Database Name]** → **Data Collections** → **Emissions**
12. Select **Add** → **Folder** from the Home Ribbon
13. Enter **ExceptionDuration** as the name of the folder and click on Apply
14. Select the **ExceptionDuration** folder
15. Right-click and add **Calculated Tag**
16. Set the name of the Tag to **Dust**
17. Add the **Periodic\1h** time trigger with the name **1h**
18. Switch to the Expressions tab
19. Set the expression to:
\$Emissions.ExceptionDuration({{data:LogGrp.Emissions.
Dust}}, 5, 3600)

All calculations have now been setup, and can be used in both the TrendWorX64 Viewer and as live data values for use in GraphWorX64 or the AlarmWorX64 Server.