Problem statement:

Health index calculation is one of the most important steps in superposed prediction which scales the health of the equipment component between 0 to 100 [0 being worst and 100 being best health]. Health index equation is provided below:

$$f(s,x,y) = (1 - (2*(1/(1+EXP(-1*IF(s<x,0,s-x)/y)))-1))*100$$

s – Factor aggregated likelihood
x - Offset
y - Scaling factor

So from the above equation it is evident that the health index is dependent on the Scaling factor and offset. This document elaborates the dynamic calculation of Scaling factor and offset. To know more about Health index calculation please refer to Health index.pdf.

Objective:

To calculate **offset** and **scaling factor** for all the equipment components using a series of factor aggregated likelihoods obtained during previous prediction runs just prior to the occurrence of alarm.

Steps to generate offset and scaling factor:

1. Load the pmcounter data to appropriate tables in the standard format. Run the superposed prediction for the previously decided validation period. The frequency of prediction runs should be carefully considered based on the historical inter-failure gap.
2. The output of superposed prediction will be stored in a table called **'PerformanceCounterDegradation'** for each equipment component and KPI combination. This table will be used as input for calculating offset and scaling factor.
3. Run the Dynamic Health Index calculation code. This will upsert **offset** and **scaling factor** for all the equipment components in the **PerformanceCounterEquipmentComponent** table.

Logic used for calculating Offset and Scaling factor:

Class name: DynamicHIParameterCalculator
Method name: calculateHIParmeters()

1. Fetch 3 most recent alarms for each equipment component from the Alarm table.
2. For each selected alarm, consider the alarm occurrence time.

3. Fetch 10 prediction run outputs prior to alarm occurrence time by matching with the name of the equipment component.
    a. Each prediction run output contains predicted values at each equipment component and KPI combination.
    b. Aggregate the predicted values of all the KPIs whose values are greater than 0.3 for the given prediction run. This is called ‘aggregated likelihood’.
    c. Repeat step ‘a’ and ‘b’ for all 10 different prediction runs to obtain ‘aggregated likelihood’ for each prediction run.
    d. Finally consider the maximum aggregated likelihood found among all the 10 runs and call it as ‘selected aggregated likelihood’.
4. Repeat steps ‘2’ and ‘3’ for all the three most recent alarms and take the average of ‘selected aggregated likelihood’ and call it ‘final aggregated likelihood’.
5. Offset is calculated by considering 55% of ‘final aggregated likelihood’.
6. Scaling factor is calculated as show below:

    ScalingFactor = (‘final aggregated likelihood’ - Offset)/4
7. Update the offset and scaling factor in the performance counter equipment component table.

Note:

1. Dynamic calculation of scaling factor and offset is triggered on a daily basis by default. However the frequency of updating the scaling factor and offset can be controlled using cron patterns based on our customer specific situation needs.
2. Updating the scaling factor and offset is an important step as we need to continuously incorporate the recent alarms and their corresponding likelihood for calculating offset, scaling factor and health index.