Tips & Tricks for Managing Asset Analytics

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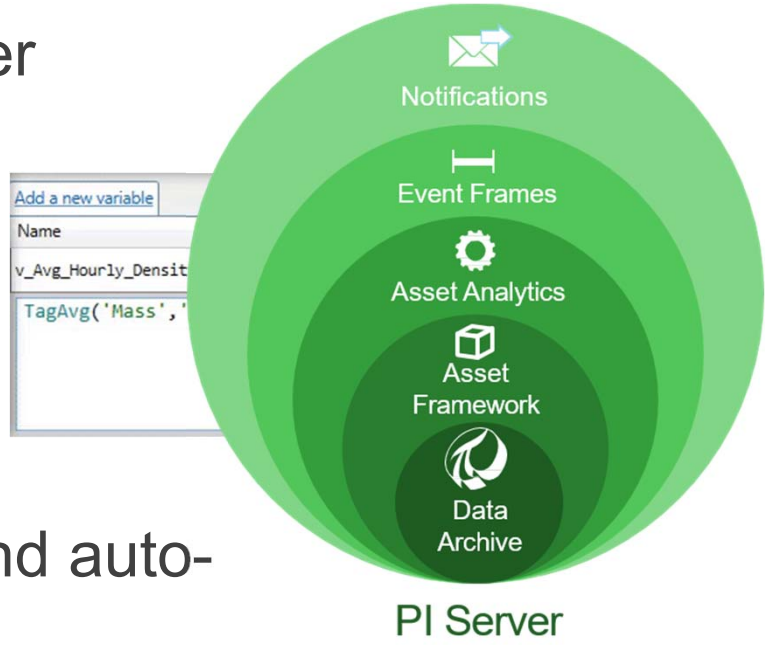
What is Asset Analytics?

- Core component of the PI Server
- Highly performant for streaming calculations
- Easy to use
  - Intuitive UI
  - Intellisence
  - Templatization (reusability)
  - 150+ built in functions
- Backfill, manual recalculation and auto-recalculation



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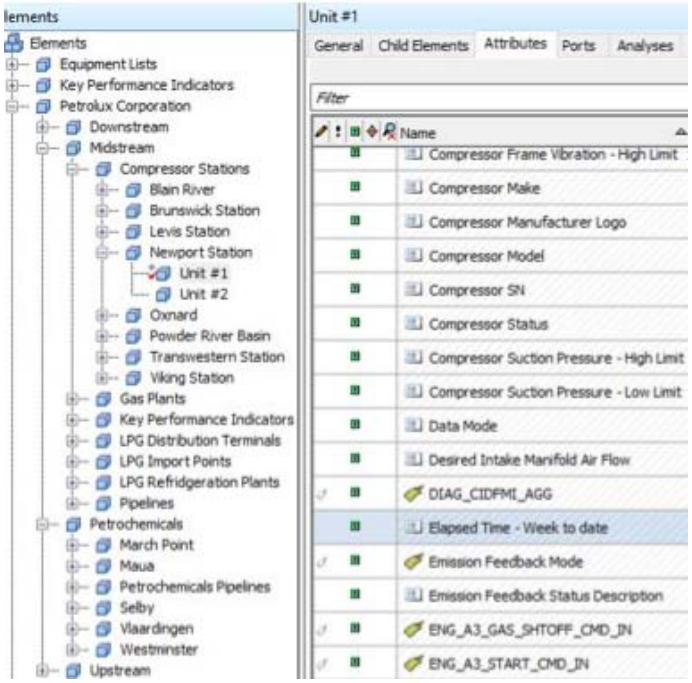
Example use case



I want to detect possible issues with my asset

- AF used to model assets and processes (using templates)
- Inputs come from asset
- Outputs used in dashboards, reporting, triggering notifications, etc.…

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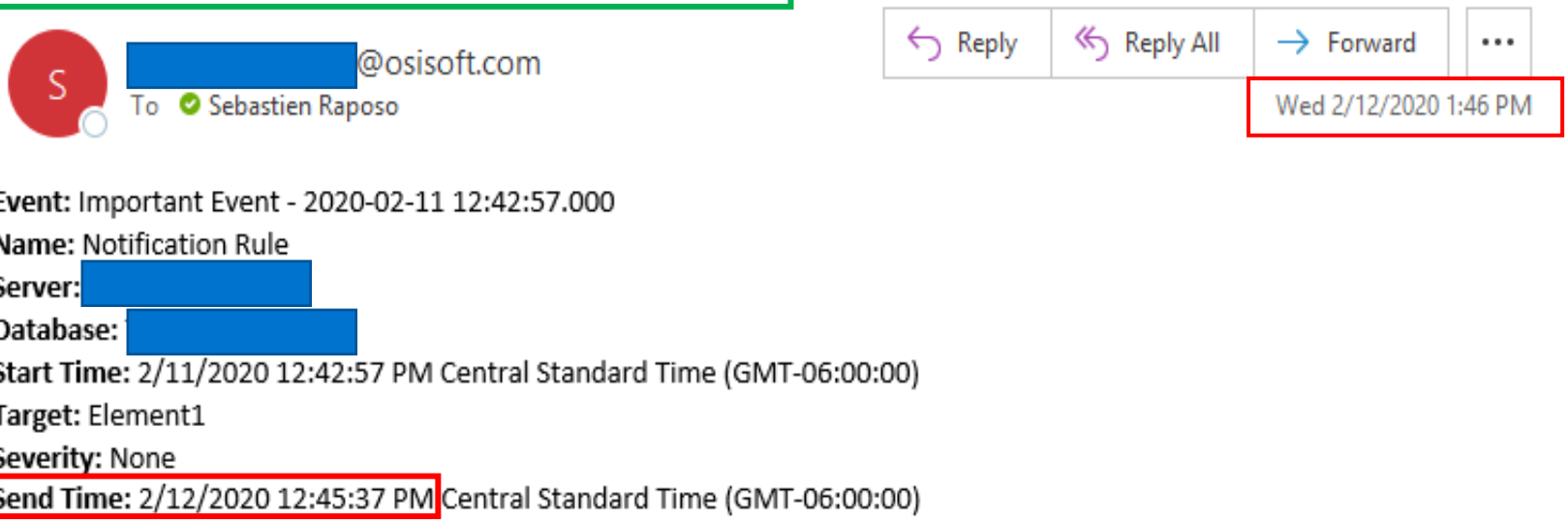
Typical symptoms of unhealthy Asset Analytics

Important Event - 2020-02-11 12:42:57.000 generated a new notification event.



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Objective

- After this talk, you should be able to manage and solve most of your issues with Asset Analytics
  - Pareto Principle (80/20 Rule)
- Or, if you are a new user, you will be able to get started on the right track

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Agenda

- Monitoring
  - Service level with Performance Counters
  - Analysis level with AFSDK
- Diagnosing (identifying culprit analyses)
  - Service Statistics
  - PI System Explorer
  - Log
- Best Practices
- Troubleshooting

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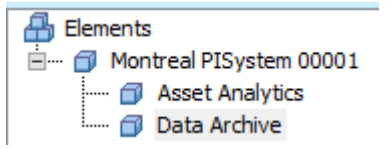
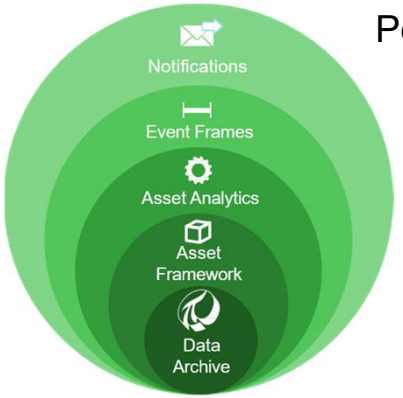
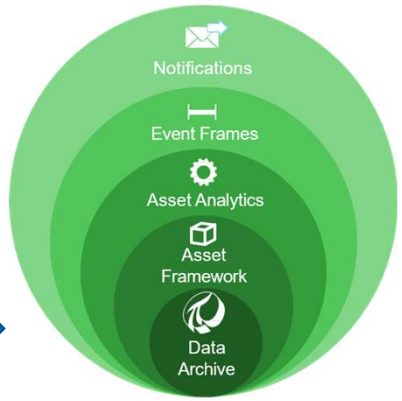
Performance Counters

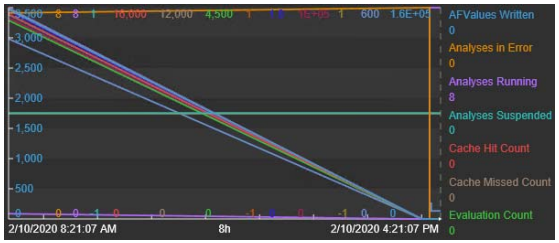


PI Interface for Performance Monitoring





PI Vision



Production PI System(s)

Monitoring PI System

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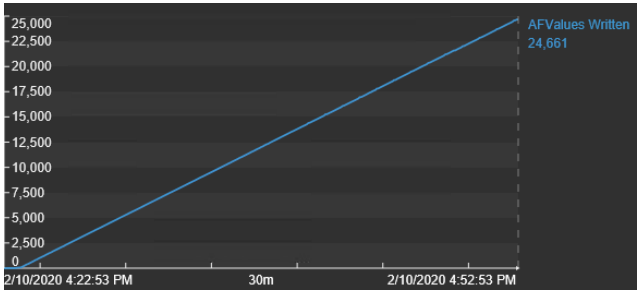
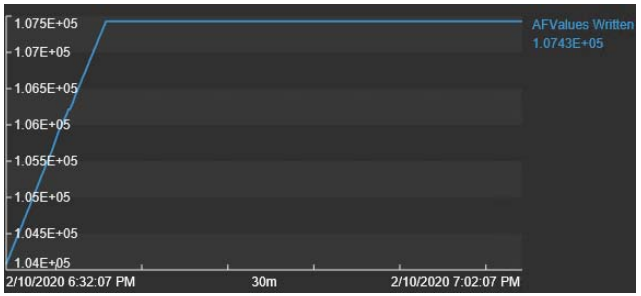
Performance Counters - AFValues Written

- Good: Values are continuously increasing
- Bad: Values are stuck at 0 or flat lined



Good



Bad

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Performance Counters - Maximum Latency

- Good: Value is constantly around 5s OR lower than tolerated latency (depends on use case)
- Ok: Value temporarily goes up and then comes back down (step behavior)
- Bad: Value is consistently increasing

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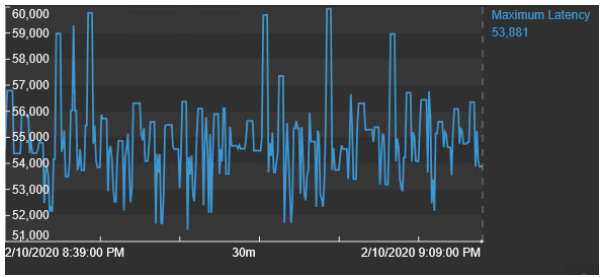
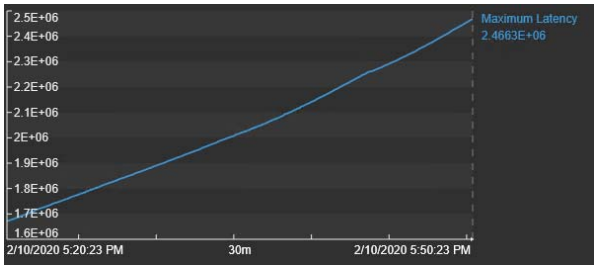
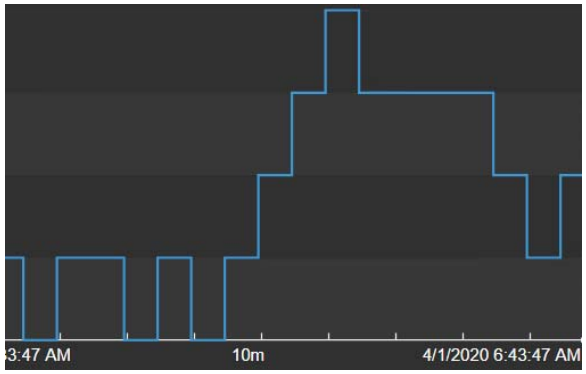
Maximum Latency



Good



Bad



Depends…

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Performance Counters – Evaluation Skipped Count

- Good: Value is constantly 0
- Ok: Value temporarily goes then flat lines
- Bad: Value is consistently increasing

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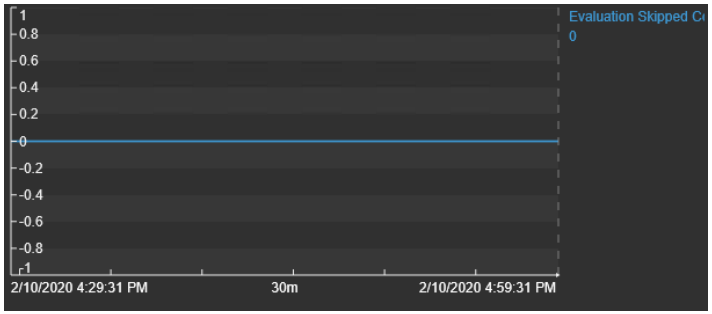
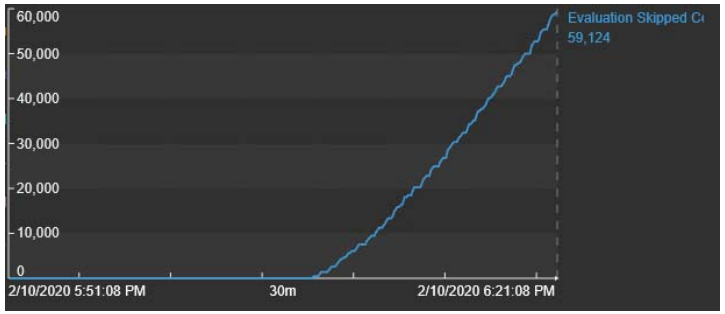
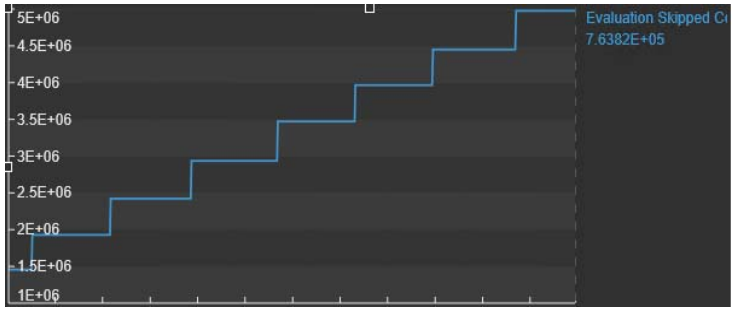
Evaluation Skipped Count



Good



Bad



It depends…

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Other performance counters (Documentation)

- Analyses in Error / Running / Suspended
- Cache Hit Count / Miss Count
- Evaluation Count / Error Count / OOO Ignored Count
- EF Written
- Events Cached / Processed
- Recalculation Requests Completed / Queued

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Programmatic access to run time statistics via AFSDK (2018 SP2)

- Retrieve statistics for particular analyses, such as:
  - Evaluation time
  - Triggering Rate
  - State (Error, Running, etc…)
  - Skip Count

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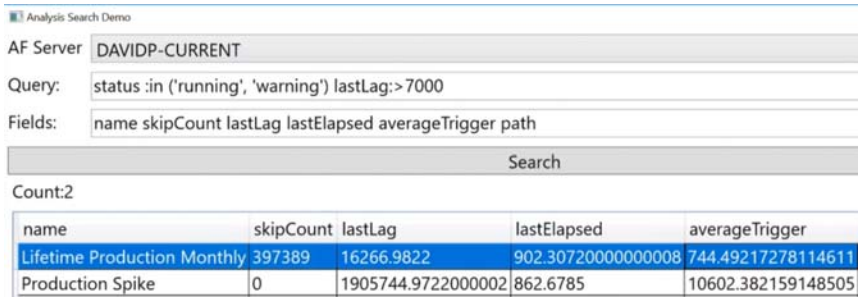
AFSDK access - Resources

- PI Square post on overview
- PI Square post on example PS1 script
- Presentation at PI World 2019



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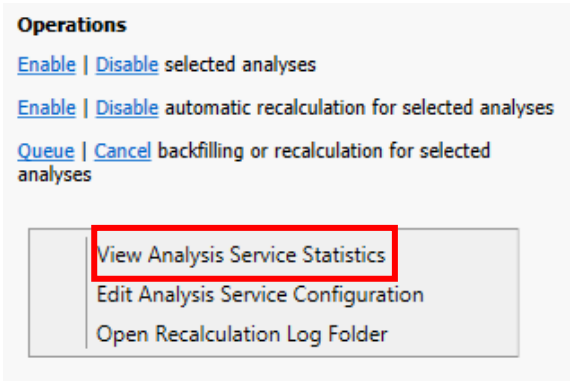
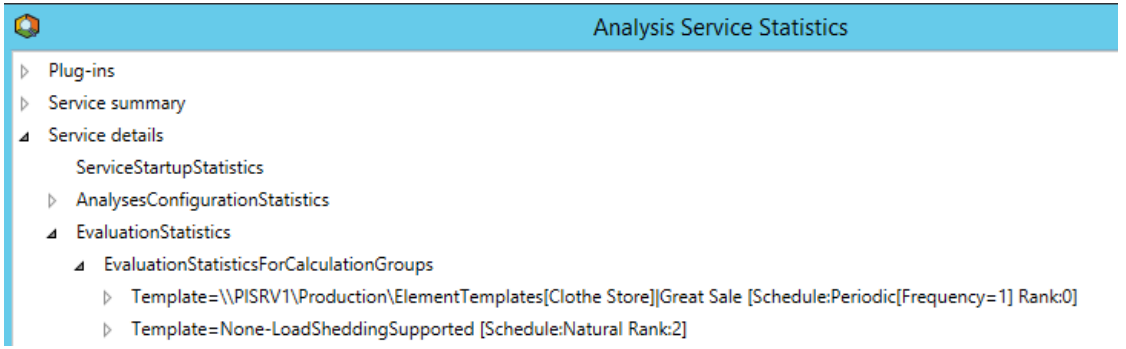
Service Statistics

- Documentation here to retrieve statistics
- Great PI Square post here on how to analyze the statistics





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Analysis Groups & stats

- Template=<TemplatePath>[Schedule:<Schedule>Rank:<Rank>]

Template=\\PISRV1\Production\ElementTemplates[Clothe Store]|Great Sale [Schedule:Periodic[Frequency=1] Rank:0]

Name	Value
GroupID	9f843ebf-8cb0-4696-bf8f-4286f870e6f3
TotalEvaluationsPerSecond	3
ValuesPublishedPerSecond	0
EventFramesPublishedPerSecond	0
CurrentLag	00:18:38.2851202
SkippedEvaluationPercentage	0

Name	Value
Id	edc0253e-a7b0-4992-9919-16feffb5e77a
Count	3231
FirstTriggerTime	4/21/2017 6:52:09 PM
LastTriggerTime	4/21/2017 7:45:59 PM
Duration	02:19:52.6282052
AverageLagMilliSeconds	2574032.33581999
AverageElapsedMilliSeconds	2594.31556722378
AverageTriggerMilliSeconds	1000
AverageAnalysisCount	20

TriggerRatio = AverageElapsed/AverageTrigger = ~2.5 -> Group will lag perpetually

The lower the TriggerRatio the better. Should be below 0.15 ideally

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More group statistics

Name	Value
EvaluationCount	9264
SkippedCount	0
DuplicateIgnoredCount	0
OutOfOrderIgnoredCount	0
ErrorCount	0
TotalMilliseconds	5966712.1983
MaximumChunkMilliseconds	7232.4209
TotalEvaluationCount	9264

Name	Value
ExecutionTime	2/12/2020 2:53:48 PM
RetrievalTime	2/12/2020 2:53:48 PM
DataToWallClockOffset	00:00:00
SchedulingLag	00:18:34.9078039
EvaluationLag	00:00:03.3773163
DataWriteDuration	00:00:00
DataWriteRequestsCount	1
Lag	00:18:38.2851202
NumberOfAnalysesInExecutionQueue	8912
TimeClassAnalysisCount	8

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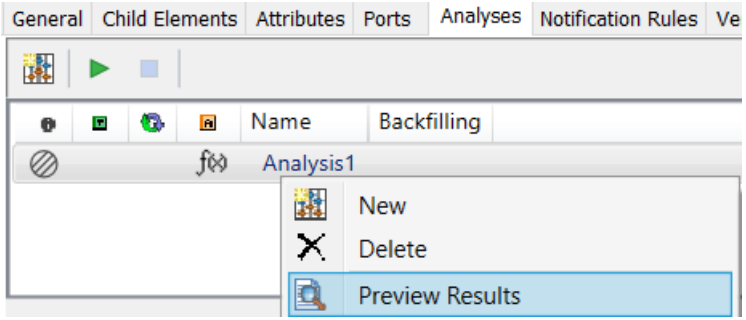
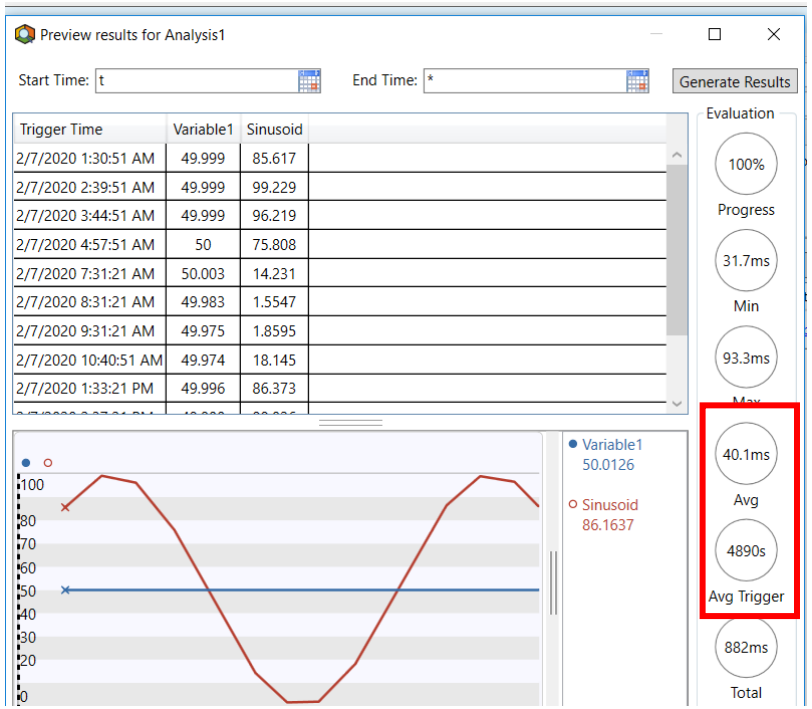
Diagnosing - PI System Explorer





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Performance Evaluation logger

- Documentation or YouTube video

```
<rules>
  <logger name="OSIsoft.AN*" levels="Fatal" writeTo="eventLog" />
  <logger name="*:Evaluation" minlevel="Info" writeTo="logfileAsync" final="true" />
  <logger name="*:Scheduling" minlevel="Info" writeTo="logfileAsync" final="true" />
  <logger name="*:Recalculation" minlevel="Info" writeTo="logfileAsync" final="true" />
  <logger name="*:DataRetrieval" minlevel="Info" writeTo="logfileAsync" final="true" />
  <logger name="*:Configuration" minlevel="Info" writeTo="logfileAsync" final="true" />
  <logger name="*:Performance" minlevel="Info" writeTo="logfileAsync" final="true" />
  <logger name="*:PerformanceEvaluation" minlevel="Trace" writeTo="logfileAsync" final="true" />
  <logger name="OSIsoft.AN*" minlevel="Info" writeTo="logfileAsync" />
</rules>
```

```
2019-03-20 00:10:24.2594|TRACE|ANPerformanceTrace:PerformanceEvaluation|Type: AnalysisEvaluated, Data: {
"AnalysisName": "\\\\AFSERVER\\PISquare_Blog\\Element1\\Analyses[RepeatingFunction]",
"AnalysisId": "6ad221b9-4a84-11e9-9149-001ddab729f5",
"GroupId": "65bc6d2e-b817-4da1-ad3f-49d87363a78b",
"TimeclassId": "2bd79cda-02a9-4718-b403-5b6e90fb46c8",
"Status": "Success",
"ExeTime": "2019-03-20T04:09:49Z",
"Detail": "",
"ElapsedMilliSeconds": 33.8356,
"LagMilliSeconds": 5179.3228
}
```


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How to automate detection of culprit analyses?

- Programmatic access to runtime statistics introduced in 2018 SP2…
- Example for latency:

```
$query = "status:'Running' averageLag>'60000’
sortBy:'averageLag' sortOrder:'Desc’”

$fields = "path lastEvaluationStatus
lastEvaluationStatusDetail lastLag averageLag
averageElapsed averageTrigger"
```


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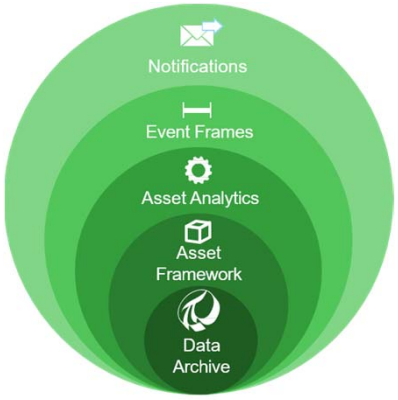
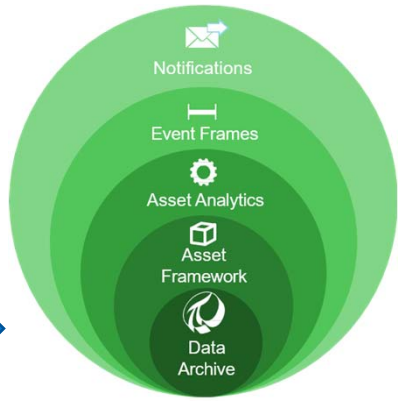
Automate monitoring with AF SDK



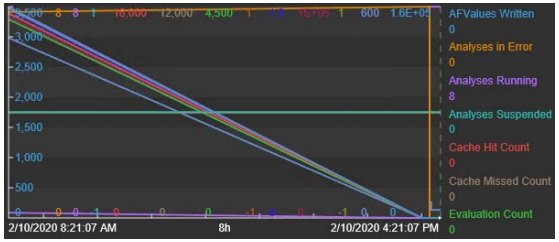
Production PI System(s)

AF SDK Programmatic Access



Monitoring PI System

PI Vision



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Best Practices

- PI Analysis Service Best Practice article has to be read before troubleshooting

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Troubleshooting – Approach taken by OSIsoft Product Specialist

- Assumptions:
  - Culprit analyses have been identified
  - Best Practice article has been read
- Look at analysis configuration (calculations and scheduling)
- Look at analysis inputs

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Analysis Configuration

- Are there any expensive functions
  - Long summary function (Example TagAvg() over a month…)
- Are there any repeating functions with same inputs
- Does the scheduling make sense with what the analysis is doing

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Inputs

- Are any of the inputs in error?
  - Handling with BadVal() is ok, but if the error can be prevented that is better
- What's the data density of the inputs?
  - Events every second, minute, etc…
- What are the data references?
  - Any expensive formulas or table lookups etc…

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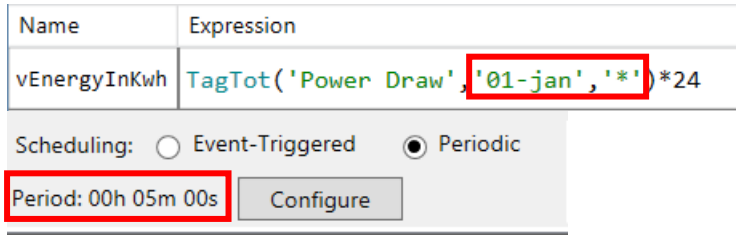
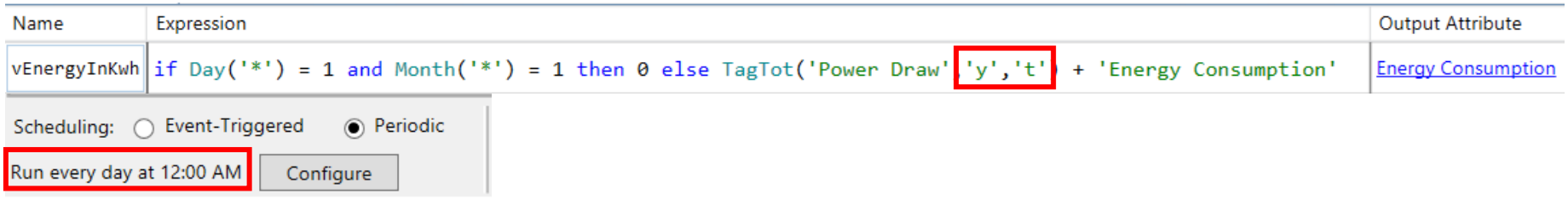
Example 1



- Scheduling is too aggressive and/or time range in summary function is too long



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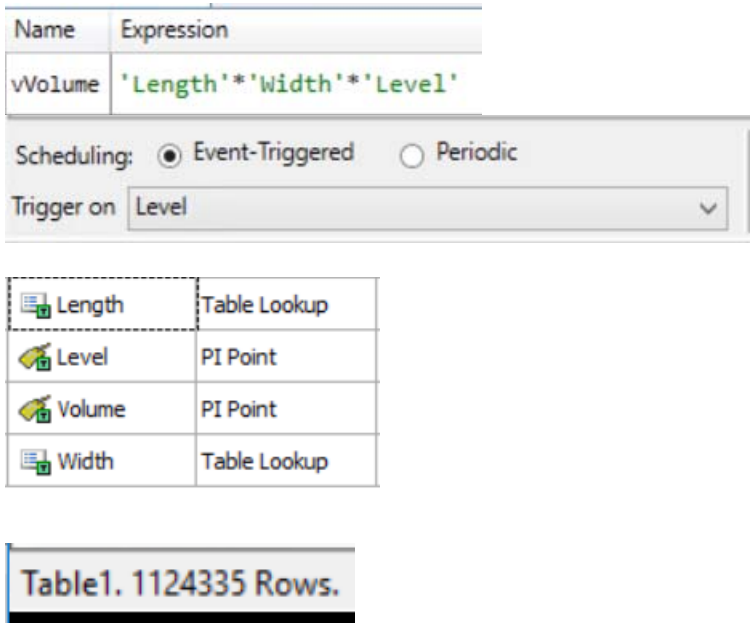
Example 2



- Slow analysis has a simple configuration. Issue is with a dense input
- Solution: Reduce size of table! Can be done using parametrized queries

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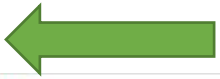
Example 3

Name	Expression
vState	If BadVal(TagMax('input','*','*-24h')) Then "Bad Value" else if TagMax('input','*','*-24h') > 0 and TagMax('input','*','*-24h') <50 then "Low" else if TagMax('input','*','*-24h') >50 and TagMax('input','*','*-24h')<100 then "Average" Else "High"

Name	Expression
vMax	TagMax('input','*','*-24h')
vState	If BadVal(vMax) Then "Bad Value" else if vMax> 0 and vMax <50 then "Low" else if vMax >50 and vMax <100 then "Average" Else "High"



Use a variable to avoid running the same calculation multiple times

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System Best practices

- Use latest version
- Hardware sizing for SQL and Analysis
  - We have a sizing guideline
- Dedicated node for Analysis for large scale deployment
- Asset Analytics server should be “close” to Data Archive and AF Server (and any external system it connects to)

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System Best Practices - Continued

- Use templates
- Use proper compression settings
- Minimize out of order data
  - This is true for the PI System, not specific to Asset Analytics

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There is a limit to every system

- Asset Analytics can scale to a large number of Analyses!
  - The amount depends..
- If all analyses follow best practices and there are still issues with the system OR any change causes the system to tip to a bad state… might be time to split the system.
  - Reach out to Tech Support

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Questions?

Please wait for
the **microphone**

State your
name & company

Save the Date...

AMSTERDAM
October 26-29, 2020

OSIsoft. PI World

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