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Inline Calculation Filter Administration Guide

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Contents

Preface	iii
Purpose	iii
Intended Audience	iii
Prerequisites	iii
Document Organization	iv
Common Abbreviations and Acronyms	iv
Where to get help	v
1 Description	1
2 Installation	3
3 Configuration	5
1 Configuration example	5
2 Configuration elements description	6
4 Simple Ratio formula description	9
5 Generic formula description	11
6 Configuration Migration Tool	13

Preface

Purpose

The purpose of this guide is to provide configuration and usage information about the Inline Calculation Filter.

Intended Audience

APG administrators and system integrators, as well as users responsible of managing data collection configuration should read this document.

Prerequisites

The *APG* collector manager must be installed. This filter module may be used with *APG* versions 5.0 and later.

Document Organization

1. Description	A description of this filter function.
2. Installation	Instructions on how to install this filter.
3. Configuration	Instructions on how to configure this filter.
4. Simple Ratio formula description	A description of the Simple Ratio formula.
5. Generic formula description	A description of the Generic formula.

Common Abbreviations and Acronyms

Not Applicable

There are no abbreviations used in this document.

Where to get help

EMC support, product, and licensing information can be obtained as follows:

PRODUCT INFORMATION - For documentation, release notes, software updates, or information about EMC products, go to EMC Online Support at:

<https://support.emc.com>

TECHNICAL SUPPORT - Go to EMC Online Support and click Service Center. You will see several options for contacting EMC Technical Support. Note that to open a service request, you must have a valid support agreement. Contact your EMC sales representative for details about obtaining a valid support agreement or with questions about your account.

Description

The inline calculation filter is used to calculate and generate RawValues derived from the collected data. Typical use cases include:

- Calculation of IPSLA derived metrics, such as probe operation failure rate.
- Composite failure indicators, used conjointly with Watch4Net's Alerting module.
- Inline calculation of bandwidth usage.

It basically allows the calculation of metrics that are not directly provided by the data collector.

A set of two basic formulas are provided with this filter:

- The simple ratio formula, which is used to calculate many Cisco IPSLA derived metrics.
- The generic formula, which is user configurable and versatile enough to cover most purposes.

Both formulas usage is described in this document.

2

Installation

The Inline Calculation Filter module may be installed like any other module. The package name is: "inline-calculation-filter". Use the module manager to install this module.

Then, edit the `APG/Collecting/Collector-Manager/Default/conf/collecting.xml` file (location may vary depending upon installation location and Collector-Manager instance name) and insert the following line in the existing configuration. Please refer to the *APG* Backend Administration Guide if unsure on how to do this.

```
<?xml version="1.0" encoding="UTF-8"?>
<config ...>
  <connectors>
    ... connector already defined ...
  </connectors>
  <filters>
    ... next filter ...
    <filter enabled="true" name="MyFilter" next="NextFilter"
      conf="Inline-Calculation-Filter/Default/conf/MyFilterConf.xml" />
    ... previous filter ...
  </filters>
  <collectors>
    ... collectors already defined ...
  </collectors>
</config>
```

The “MyFilterConf.xml” configuration file should be located in the APG/Collecting/Inline-Calculation-Filter/Default/conf/ directory. This file will contain your customized configuration for this filter. Create and edit as explained in this document’s Configuration section. Then restart the *APG Collector Manager* service.

Configuration

This section contains a configuration example as well as the description of the available configuration elements.

1 Configuration example

Let's use the following example in order to create a configuration for this filter:

```
<?xml version="1.0" encoding="UTF-8"?>
<config xmlns="http://www.watch4net.com/Collecting/InlineCalculationFilter1" xmlns:xsi="http://
www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://www.watch4net.com/Collecting/
InlineCalculationFilter1_InlineCalculationFilter1.xsd">

  <result name="CurrentUtilization" unit="%" time-window="30s">
    <input>ifInOctets</input>
    <input>ifOutOctets</input>
    <input keep="true">ifSpeed</input>
    <group-by>device</group-by>
    <group-by>part</group-by>
    <group-by>part</group-by>
    <filter><![CDATA[devtype=='Router' | devtype='Switch']]></filter>
    <properties propagation="all" />
    <jexl-formula><![CDATA[
if (ifInOctets ge ifOutOctets) {
  if (((ifInOctets * 8 / ifSpeed) * 100) le 100) {
    ((ifInOctets * 8 / ifSpeed) * 100);
  } else {
    NaN;
  }
} else {
  if (((ifOutOctets * 8 / ifSpeed) * 100) le 100) {
    ((ifOutOctets * 8 / ifSpeed) * 100);
  } else {
    NaN;
  }
}
]]></jexl-formula>
  </result>
</config>
```

Note: Please use an XML editor which supports XML schema validation to edit this configuration file.

2 Configuration elements description

Elements and attributes are as follows:

- `<result name="CurrentUtilization" unit="%" time-window="30s">`
This element specifies the name property of the calculated raw value, the time window size (maximum number of seconds between the first and last input values to compute the metric: this usually matches the polling period for the input raw values) and the calculated raw value unit (typically: ms, Kbytes, Koctets, Mbytes, etc).
- `<input keep="true">ifSpeed</input>`
This element defines the name of a metric used as input in the formula. The optional attribute is used to keep any collected value, even if it is outside the specified time window. This attribute proves useful for metrics that are not collected often: usually used for inventory purposes and stable over time.
- `<group-by>device</group-by>`
This element specifies the way to group the raw values in order to calculate the resulting metric. One or more raw values properties may be used for this purpose. Typical properties to use here are: source, device, part, parttype.
- `<filter><![CDATA[devtype=='Router' — devtype='Switch']]></filter>`
This filters raw values based on their properties. This is the same filter syntax in available in APG's frontend. In this case, only the raw values with a property named devtype, which value is either Router or Switch, will be used for this calculation. This is an optional configuration element: all raw values will be used for calculation if it is not specified.
- `<properties propagation="all"></properties>`
The propagation attribute may be set to `all` in order to retrieve all of the properties from all the raw values used in the calculation and put them in the resulting calculated metrics. Setting this to `true` may affect performance slightly as well as increase memory consumption. Possible values are `grouping` which uses the properties mentioned in `group-by` elements only, `selected` which takes the ones defined within this element, and `none` which does not forward any. Default value is `all`.
- `<jexl-formula>`
The formula then describes how the result will be computed. Possible configurations are `jexl-formula` which takes the formula in a simplified definition, `ip-sla-packet-loss-formula` or `ratio-formula` which both use a custom configuration explained later in this guide, and `external-formula` which takes the name of a formula as attribute and some specific configuration as value.

Here is a typical content for the `inline-calculation-filter.xml` file (used to calculate interface bandwidth). This configuration could be used to calculate the interface bandwidth, assuming that it is in full duplex operation mode.

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<config xmlns="http://www.watch4net.com/Collecting/InlineCalculationFilter1" xmlns:xsi="http://
www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://www.watch4net.com/Collecting/
InlineCalculationFilter1\inline-calculation-filter.xsd">
  <result name="bandwidth" unit="Mbits/s" time-window="5m">
    <input>ifInOctets</input>
    <input>ifOutOctets</input>
    <input>ifSpeed</input>
    <group-by>source</group-by>
    <group-by>device</group-by>
    <group-by>part</group-by>
    <properties propagation="grouping"/>
    <ratio-formula multiplier="400.0">
      <numerators aggregation="sum">
        <numerator>ifInOctets</numerator>
        <numerator>ifOutOctets</numerator>
      </numerators>
      <denominators aggregation="sum">
        <denominator>ifSpeed</denominator>
      </denominators>
    </ratio-formula>
  </result>
</config>
```

The calculation performed by this formula is equivalent to:
 $((\text{ifInOctets} + \text{ifOutOctets}) * 8 * 100) / (2 * \text{ifSpeed})$

4

Simple Ratio formula description

The simple ratio formula is hardcoded to perform the following calculation:

```
{offsetResultFromMetric|offsetResultFromConstant} {+|-}  
([avg|max|min|sum] <numerator> / [avg|max|min|sum] <denominator>) * [Multiplier]
```

No values are sent on mathematical errors (such as division by 0, infinity result, not a number, etc).

5

Generic formula description

The generic formula is much more versatile than its Simple Ratio counterpart. It allows most types of standard calculation (arithmetic operations are supported: + - / *, div, mod). However, the user must program this formula to perform the requested calculation. The programming syntax is similar to JEXL expressions (please refer to

<http://commons.apache.org/jexl/reference/syntax.html>

for further information about JEXL syntax.).

The following is a simple example of generic formula usage:

```
<jexl-formula>if (ifSpeed gt 0.0) {(400 x (ifInOctets + ifOutOctets) / ifSpeed);} else {NaN;}</jexl-formula>
```


6

Configuration Migration Tool

As the configuration was simplified with the version 6.0 of this filter, when installing the new version, one might need to migrate some existing configuration files from the old format to the new one.

In order to perform such a time-consuming task, a tool has been provided with the 6.0 version. It is available in the `bin` folder of the installed filter and takes the path to the directory that contains the configuration(s) to migrate as first argument, and the name of the configuration file(s) to migrate as additional arguments.

The migration tool will create a backup for each specified configuration file, and then replace their contents with the updated syntax. Please note that as each configuration now also contains formulas definitions, the corresponding formula definition files are not needed anymore.

So in order to migrate existing configurations, copy all configuration files to the `conf` folder of the new filter, run the command on the main ones, and then remove backups and secondary configuration files (that is, the now unused formula definition files). For instance, in order to migrate the standard configurations of that filter, one would call the command as follows.

```
./bin/config-migration-tool.sh conf availability-bandwidth.xml inline-calculation-filter-ipsla.xml server-memory.xml
```

WARNING: Some filters might not be migrated properly since the former syntax allowed regular expressions and the new generated filters comply with the APG filter syntax. Please make sure to double-check them to ensure they are still valid.