JDisc Discovery 5.0

Measurement Add-On

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1 Introduction

JDisc Discovery's Measurement Add-On extends JDisc Discovery's discovery with measurement functionality.

The Measurement Add-On enables administrators to easily track performance and usage data from a variety of different devices.

It can track any performance counter on Windows computers, track page counters and toner/ink usage for printers, and temperature or humidity information from sensor devices.

When measurement is enabled for a device, JDisc Discovery periodically collects measurement data and stores the raw values in JDisc Discovery's database.

Reports display raw and min/max/average values. Also graphical views including bar and line charts are available to visualize measurement data.

JDisc Discovery can also track software usage on Windows computers. Self-definable filter rules make it possible to monitor only desired software / processes.

2 Performance Measurement

This chapter describes the basic concepts and how to enable performance measurement for selected devices.

2.1 Concepts

The concepts chapter explains the workflow and basic concepts for collecting measurement information from various devices

The general workflow consists of the following steps. Not all steps might be required for all devices (depending on the operating system and the protocol used for the collection)

- *Enable*
  Enable measurement data collection for a list of selected devices using the report's context menu. In the second step during the measurement configuration, administrators can select what counters and measurement data to collect and what the sampling rate should be.
- *Polling*
  Once measurement has been successfully enabled on the devices, the polling phase periodically collects the measurement information and stores the raw information within JDisc Discovery's database.
- *Pause/Resume*
  Measurements can be paused and resumed on request.
- *Disable*
  Disable measurements once it is no longer required.

Whenever you enable measurement for a particular device, you create implicitly a *configuration*. A configuration defines a set of counters and measurement values, the *sample* and the *polling interval*. There may be multiple configurations for a single device (e.g. one configuration sampling CPU load every 5 minutes and another one sampling memory information every 15 minutes). The sample interval defines how frequently to gather a data point. The polling interval (if applicable) defines how often to collect locally cached measurement data from a device. For instance, you might define to collect CPU utilization for Windows computers every 5 minutes (sampling interval), but collect the actual data only once a day (polling interval). Note that devices which don't support local storage of measurement data do not support a polling interval. In this case, the polling interval is the sampling interval.

The *sampling interval* defines how frequently to gather a data point for a measurement counter.

The *polling interval* defines how frequently to collect locally cached measurement information from devices (e.g. Windows Performance Monitor data). Note, that the polling interval is not applicable to all devices or operating systems.

Configurations define the set of measurement counters, the sampling and the polling interval. There might be multiple configurations for a single device.

2.2 Data Structure

JDisc Discovery stores the measurement data within its database. Therefore, it creates a hierarchy. The first level of the hierarchy is the *object*. The object defines the item that the measurement data is collected for. Examples for objects are *Processor*, *Physical Disk*, *Memory*, etc.

If there are multiple instances of an object (e.g. multiple processors within a server), then Windows Performance Monitor usually supports to collect measurement data for each individual instance (e.g. for each processor) and it also usually supports an instance which holds the totals.

Finally, there are the actual measurements. The measurements can either reside within the instance or in case there are not instances directly within the object.

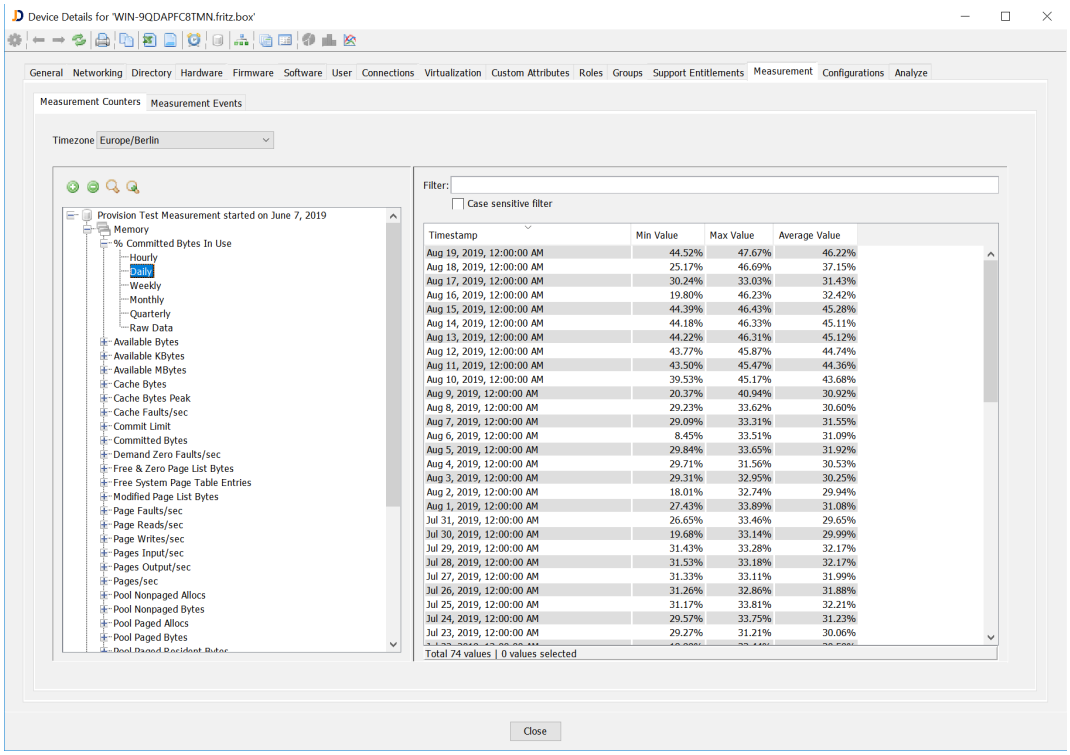

Figure: Counter Hierarchy

2.2.1 Measurement Data On Windows

JDisc Discovery uses the Windows Performance Monitor in order to gather performance counter. When enabling a measurement data, JDisc Discovery creates a new user defined data set with the desired counters and sampling interval. Windows Performance Monitor then starts to collect the counter information and stores it locally on its hard drive (usually in the c:\PerfLogs folder). It is possible to enable multiple configurations for a single device.

Then periodically, JDisc Discovery connects to the Windows device and gathers the Windows Performance Monitor values that have been stored so far. This process is called data polling. When the data has been collected, then JDisc Discovery deletes the old Windows Performance Monitor log files in order to save disk space.

When the user disables the data collection, then JDisc Discovery deletes the Windows Performance Monitor configuration and thus the data collection stops.

Enabling a measurement collection for Windows requires JDisc Discovery's zero-footprint agent. Whenever the user enables a collection a copy of *PerfMonInstrumentation* agent is copied into target system and executed one or multiple times with different parameters in order to perform the configuration.

JDisc Discovery uses templates for defining what counters to collect. It already has a set of simple built-in templates. It is possible to deploy multiple templates on one device.

It is possible to apply multiple templates for one configuration! Also you can have multiple configurations per device.

It is possible to configure multiple collections for one Windows computer. Whenever you enable a new collection, a new configuration is being created, which is uniquely identifiable by installation identifier (a UUID) and configuration identifier (another UUID). Both identifiers are globally unique.

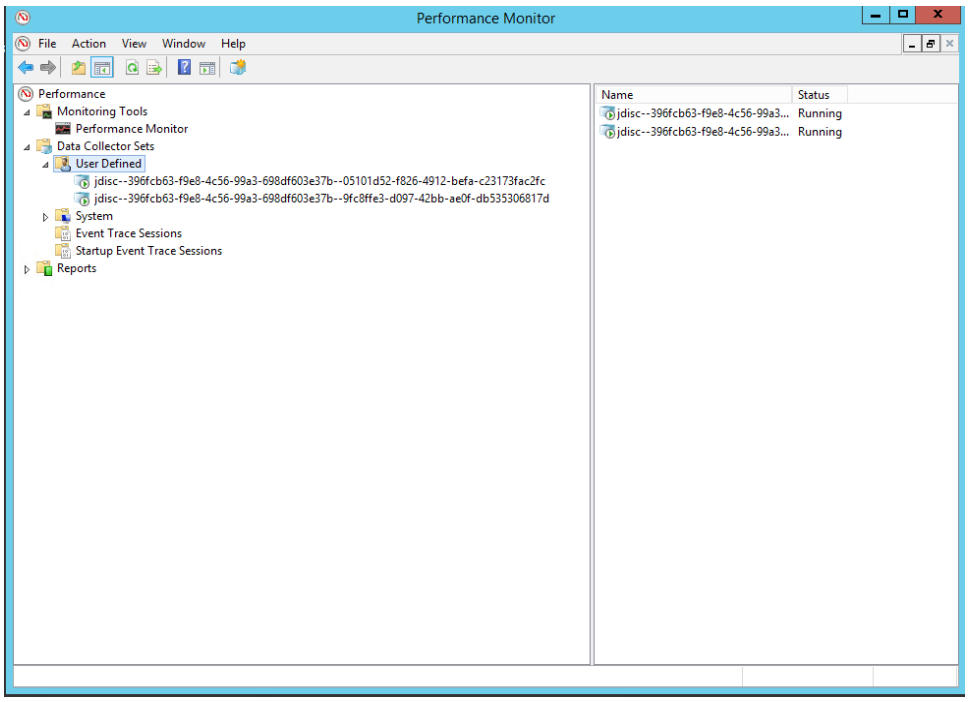

Figure: Sample JDisc Discovery Perfmon Configuration

Each configuration corresponds to a set of templates. A template consists of list of objects to be monitored (e.g. Processor Information, Physical Disk, Memory, Network Interfaces), list of counters (e.g. Transfer Bytes/sec), list of object's instances (e.g., network cards, hard disks, CPU cores) as well as raw measured data.

The actual measurement data for a configuration becomes available after first successful data polling process.

Note that due to Microsoft's caching algorithms, it can take about five minutes until the first values are available.

2.2.2 Measurement For SNMP Devices

JDisc Discovery can also measure SNMP data such as printed pages for printers, temperature or humidity for sensors, power consumption for PDUs, or network interface counters for routers and switches.

In case of SNMP based measurement collections, JDisc Discovery polls the data from the devices as configured in the configuration's sampling interval.

Note that there may be a delay caused by network latency or busy devices!

2.3 Define Measurement Templates

Windows measurement data collection is based on the Windows performance monitor (perfmon). The set of counters that perfmon supports depends on the operating system version and the installed software. For instance, a SQL server installation might add SQL server specific counters that are not available on servers that don't have a SQL server installation.

JDisc Discovery uses templates to define the set of counters to collect. There are already some basic predefined templates.

Templates define the set of counters to collect on a Windows server.

There is a set of predefined templates. New templates can be added as required.

In order to create a template, you need to choose one or more Windows computers where you have access to via our *remote login* technology.

JDisc Discovery then queries the selected devices for their set of available objects and counters and displays them in an hierarchy.

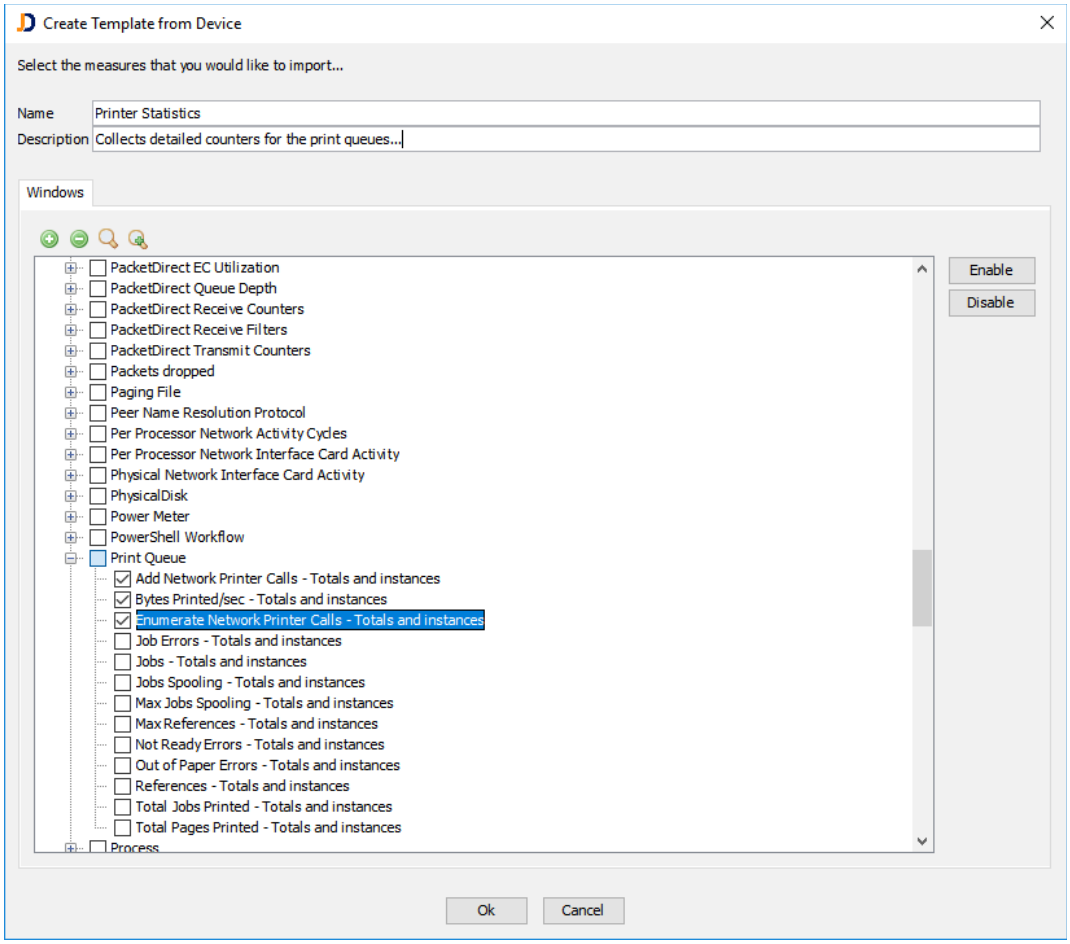

Figure: Create Template from Device

Select the objects and/or counters that you would like to include in the template, provide a name and save the template. You can select the template the next time, when you enable a measurement collection on a Windows device.

2.4 Manage Measurement Templates

Use the *Measurement » Manage Templates* dialog in order to manage your measurement templates. Add new templates, delete or modify existing templates.

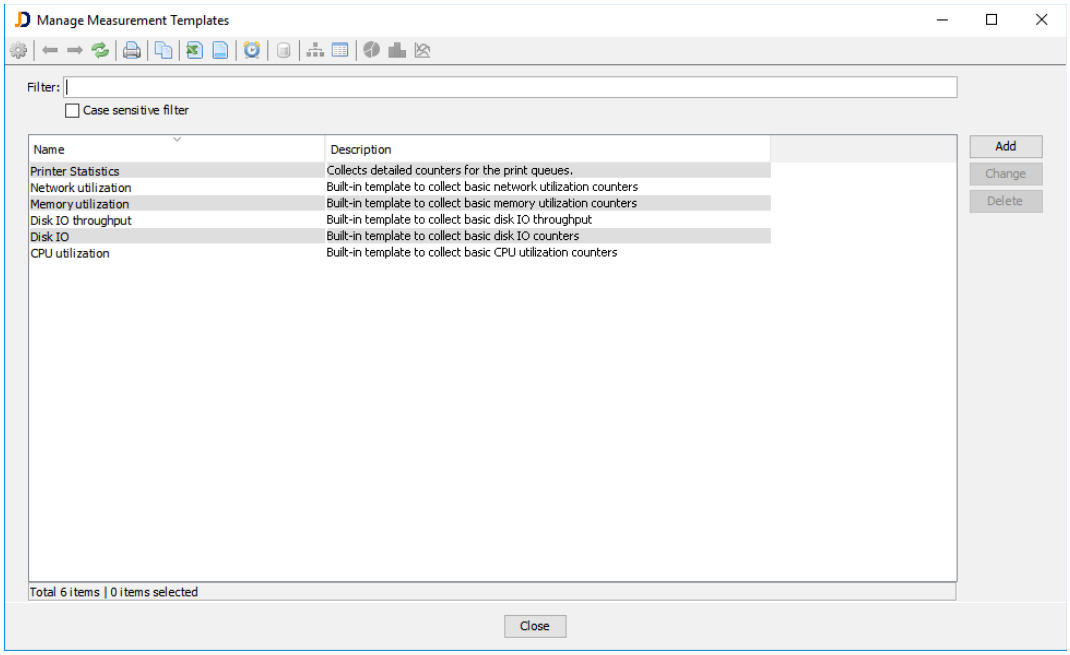

Figure: Manage Measurement Templates

2.5 Global Configuration

There are some global configuration settings for the measurement add-on. From the main window, open the *Measurement » Measurement Settings* dialog in order to change the global configuration.

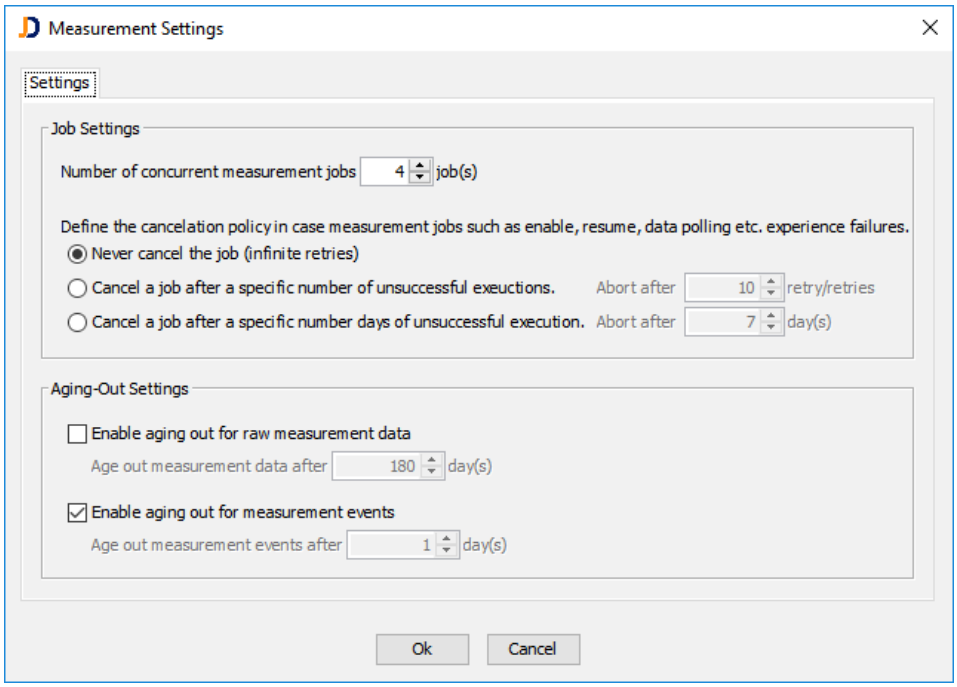

Figure: Measurement Global Settings

There are several settings to adjust. The *Number of concurrent measurement jobs* defines how many measurement jobs can run in parallel. Each data polling, enable, pause, resume or disable action is a separate job. The default is 4 concurrent jobs. Increase this value for larger networks.

The *Cancellation Policy* defines how JDisc Discovery's measurement add-on treats job failures. You can define whether or when a job changes into the stopped mode:

- *Never*
  JDisc Discovery will never stop a job and will retry the task infinitely.
- *Stop after <n> retries*
  A job execution will stop after <n> consecutive failures.
- Stop after <n> day(s)
  A job execution will stop after <n> days of unsuccessful executions.

The *Aging-Out Settings* define whether JDisc Discovery's measurement add-on discards measurement data and if yes how long to keep the measurement data. The default is to age out measurement data after 180 days.

The *Event Aging-Out Settings* define whether JDisc Discovery's measurement add-on discards measurement events and if yes how long to keep the measurement events. The default is to age out measurement data after 30 days.

2.6 Controlling The Process

This section explains the steps and actions to perform when measuring performance.

2.6.1 Enable Measurements

Select a set of devices and use the context menu *Measurement » Enable...* to enable the measurement collection on the selected devices.

Then *Enable Measurements* wizard lets you define a name for the configuration. Furthermore, you can choose what measurements you would like to configure. Currently, we have measurement configurations for Windows computers, printers, environmental sensors and routers and switches.

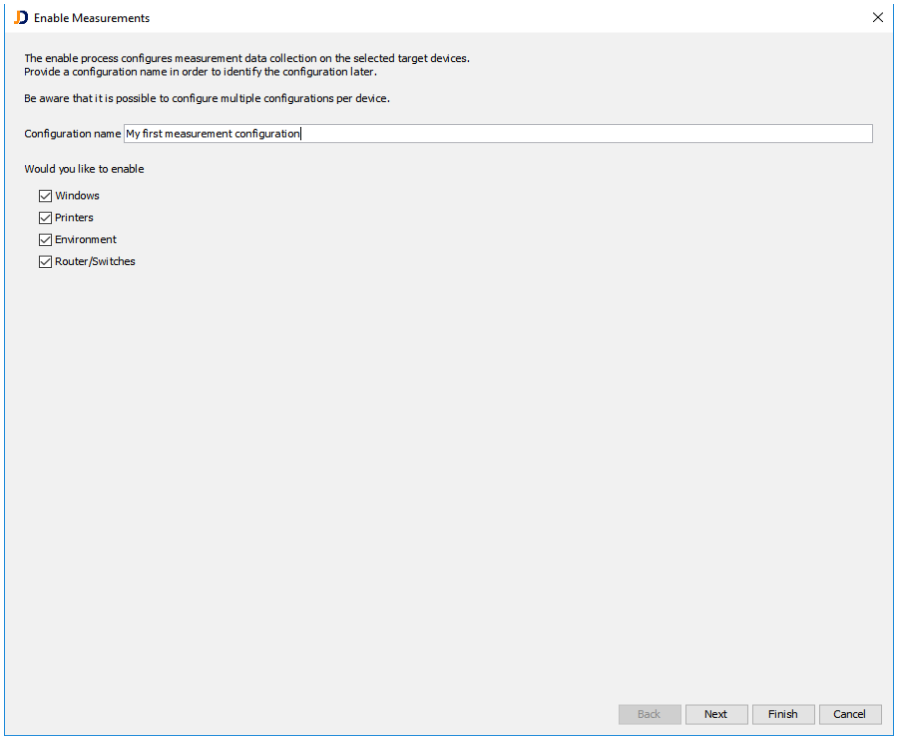

Figure: Enable Measurements – First Screen

Depending on your selection on the first screen, the next screens define the schedule and the items to collect. For Windows computers, you can select some of the predefined or customized templates. For other device types, you can use a check mark to define what measurements to collect.

There is a cancellation policy configuration section for all device types. The cancellation policy applies to all activities (e.g. enable, disable, poll data, …). You can choose between:

- *Never*
  JDisc Discovery will never stop a job and will retry a task 's database.
- *Stop after <n> retries*
  A job execution will stop after <n> consecutive failures.
- *Stop after <n> day(s)*
  A job execution will stop after <n> days of unsuccessful executions.

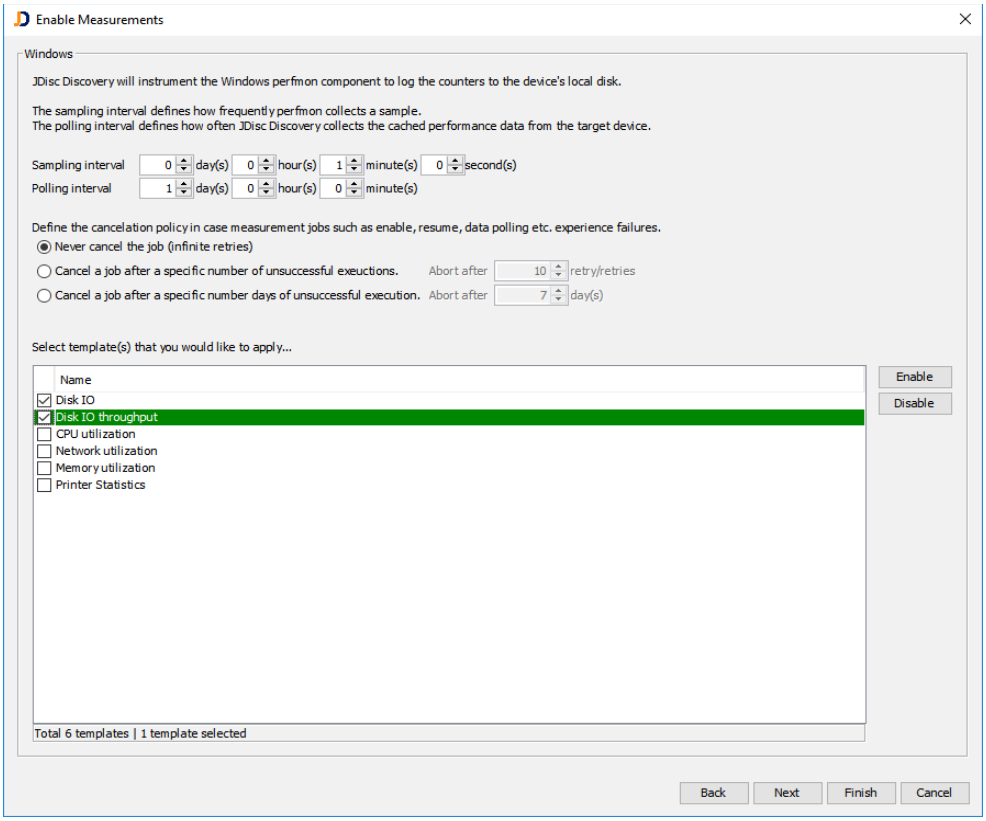

Figure: Enable Measurements

The cancellation policy defines how often the measurement add-on tries to perform a task.

This setting applies to all jobs (enable, disable, pause, poll data).

2.6.2 Polling Data Manually From Target Systems

Once the measurements are enabled, you can manually trigger a data collection. There is a slight difference between polling for Windows computers and polling for SNMP. On Windows computers, its integrated perfmon collects performance data locally once instrumented. Polling data from Windows computers means to collect the locally collected information and store all that data into JDisc Discovery's database.

For SNMP devices, the data collection actually performs ad-hoc queries and gets the current values for the configured measures. In order to poll data from devices simply use the context menu *Measurement » Import Values...* from any device report.

Manual polling takes effect on currently enabled configurations. Manual polling on disabled configurations has no effect.

2.6.3 Disable Measurements

Use the *Measurement » Disable...* menu item in order to remove any configurations or temporary data from a target system or to temporarily disable the data collection. On a Windows computer, calling disable removes the local Perfmon custom data set and all temporary information.

In essence, there are two different options:

- *Disable*
  Disable will remove any local configuration and temporary files on the target computer and remove the selected configurations from JDisc Discovery's scheduler.
  For Windows computers, this option only removes perfmon data sets only for configurations coming from the current JDisc Discovery installation.
- *Disable All*
  A call to *Disable All* will remove all perfmon configurations on Windows computers regardless of which JDisc Discovery installation performed the initial configuration.

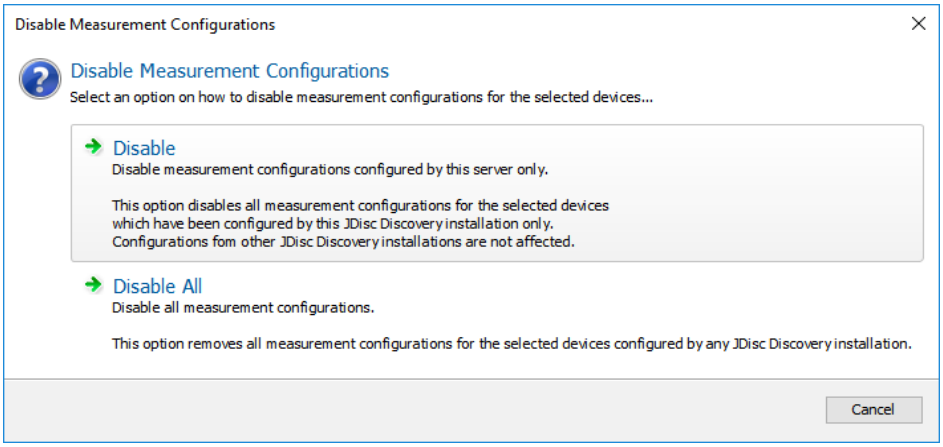

Figure: Disable Measurement

2.6.4 Pause Configurations

Use the *Measurement » Pause...* menu item to pause any existing configuration.

When this menu item gets called from any device report, then it pauses all configurations for the selected device(s).

When the menu item gets called from the Measurement Configurations report, then it pauses only the selected configurations.

2.6.5 Resume Configurations

Use the *Measurement » Resume...* in order to resume previously paused configurations.

When this menu item gets called from any device report, then it resumes all configurations for the selected device(s). When the menu item gets called from the Measurement Configurations report, then it resumes only the selected configurations.

2.7 Measurement Status

The *Measurement* tab within JDisc Discovery's main window includes a list of measurement configurations together with its state and the next execution timestamp.

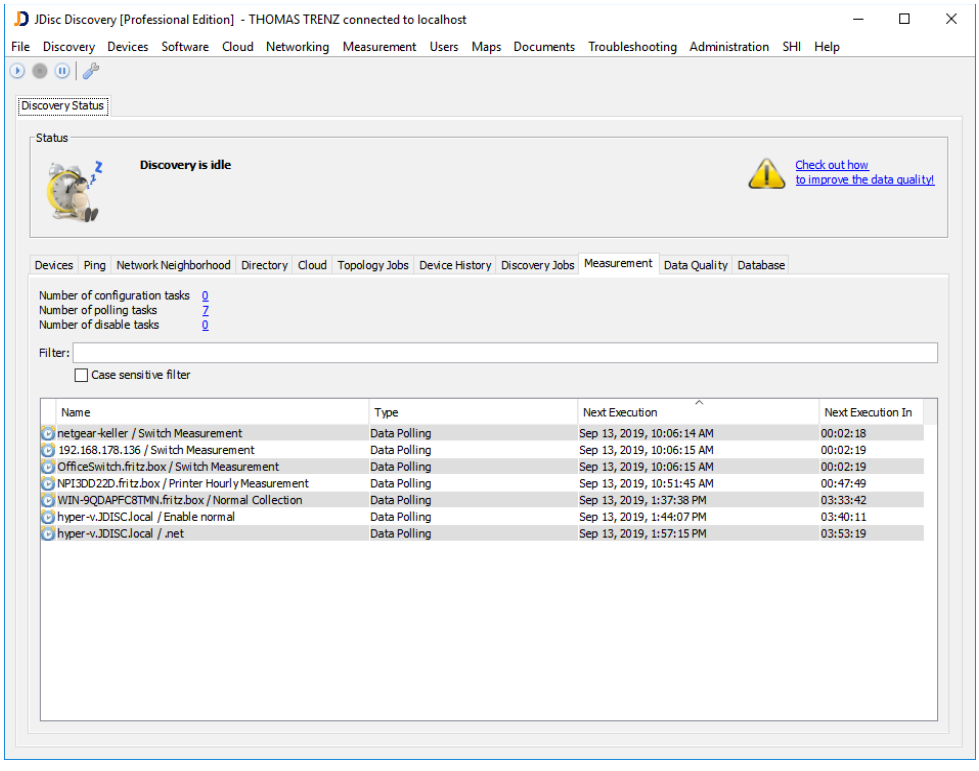

Figure: Measurement Status

2.8 Reporting

Once JDisc Discovery has collected and stored measurement information in its database, you can review the data for a specific device from the device properties dialog.

2.8.1 Measurement Data

Select the *Measurement* tab within the *Properties* dialog in order to review the measurement configurations. Open the tree items in order to review the individual objects and its counter values.

For each counter, there are hourly, daily, weekly, monthly and quarterly statistics as well as the actual raw data.

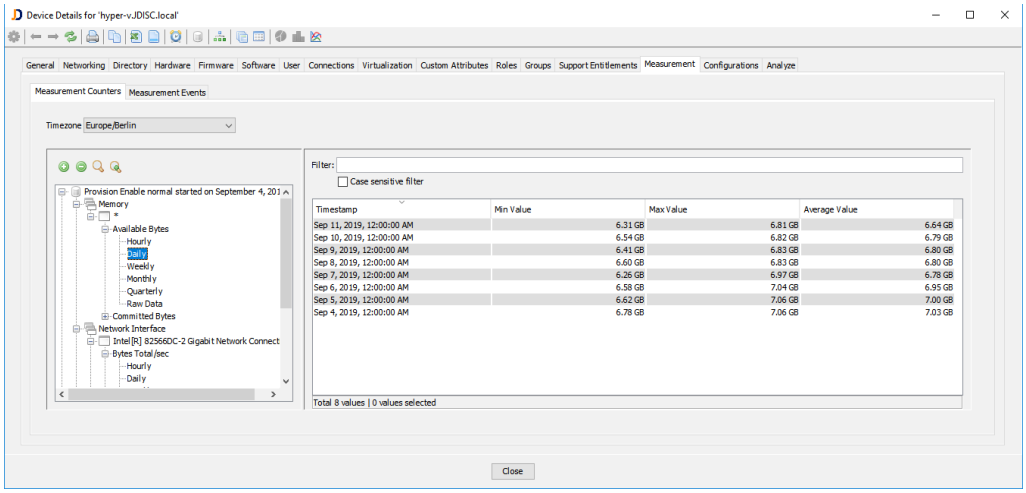

Figure: A Windows Computer with some Measurement Data

Note that you can switch the timezone in order to show the local time for the timestamps!

2.8.2 Graphs

Click on the line graph icon whenever you have selected a counter and review the counter values. That will open a line graph for the data. If you don't select a row or if only one row is selected, then the graph will include all data. Otherwise, the graph will

display only the selected rows.

Figure: Graph with min/max and average Values

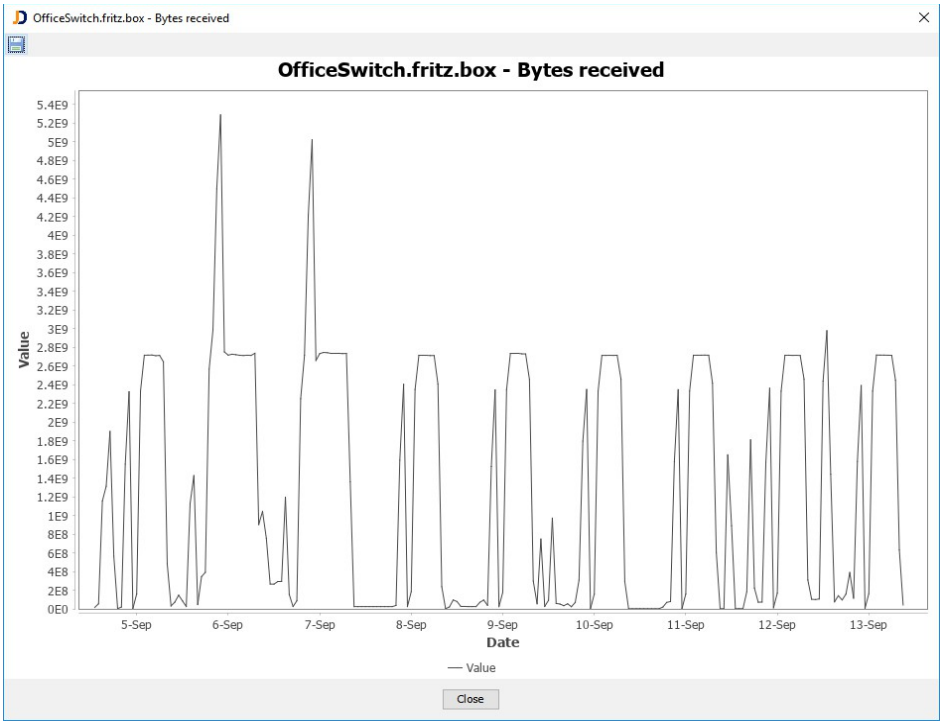

Figure: Bytes received on a Switch Interface

2.8.3 Configuration Overview

Open the report *Measurement » Measurement Configurations* in order to display all measurement configurations together with their status information as well as some timestamps:

- *Configuration Time*
  This is the timestamp when the configuration was created.
- *Last Transfer*
  This is the timestamp when the last data transfer occurred.
- *Last Import*
  This is the timestamp when the last data import occurred.
- *Last Data*
  This is the timestamp of the last data sample within this configuration.

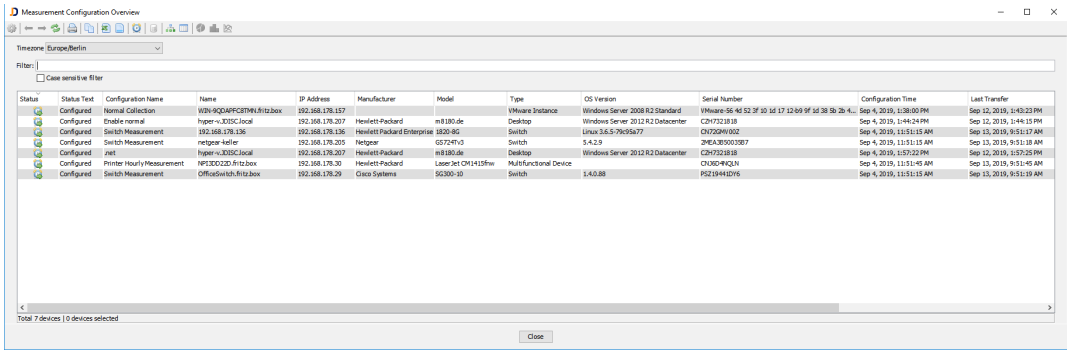

Figure: Measurement Configuration Overview

Note that you can switch the timezone in order to show the local time for the timestamps!

The configuration overview report lets you pause or disable individual configurations.

2.9 Troubleshooting

In case something goes wrong or data is missing, JDisc Discovery's measurement add-on provides events with logs when it is importing or querying measurement data from devices.

Open the *Properties* dialog and select the *Measurement* tab. The *Measurement Events* section contains the list of all measurement related activities.

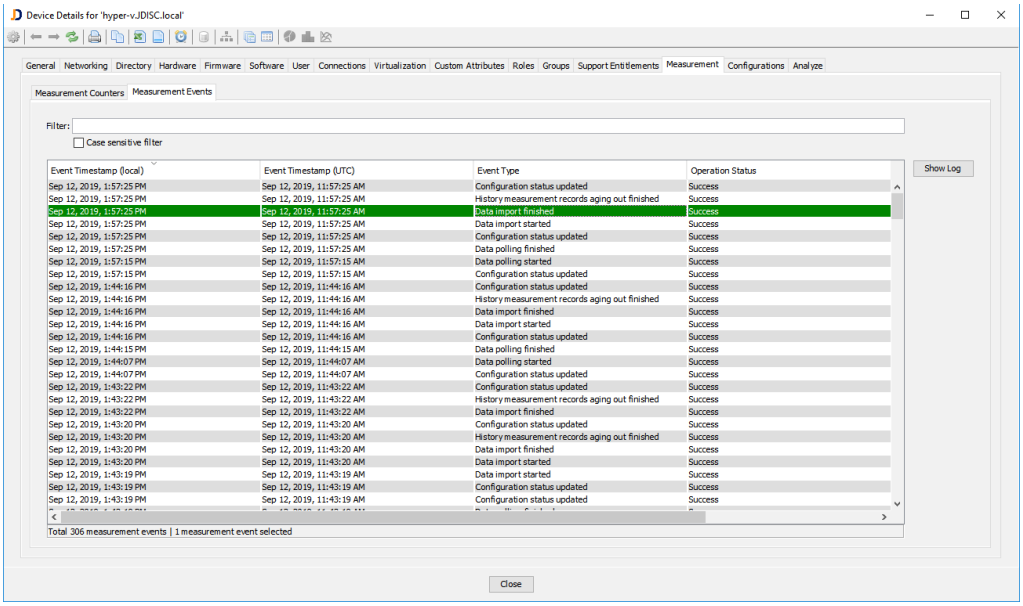

Figure: Measurement Events for a single Device

Double click on an event to open its event details.

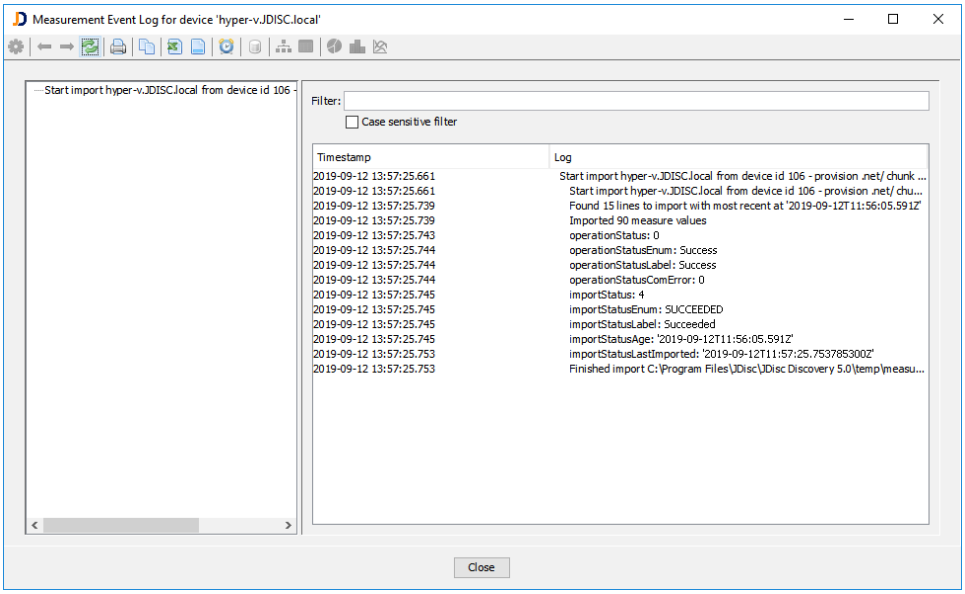

Figure: Details for a single Measurement Event

2.10 Archive And Restore

The JDisc Discovery's Measurement Add-On has significant impact on the archive and restore process.

2.11 Archiving

It is recommended to archive of the database when none of instrumentation, resume, and cleanup actions is running and application is stopped.

There are additional *Measurement Settings* available to customize the archiving process (as shown on the figure below).

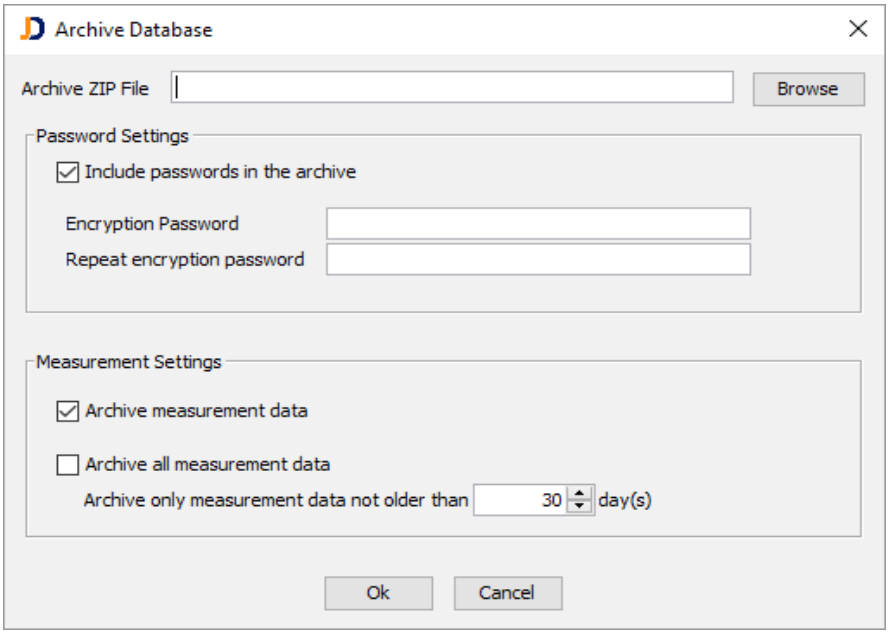

Figure: Archive Database with Measurement Data

Archive measurement data defines whether to include measurement information in the resulting archive or not.

Archive all measurement data defines to archive all gathered measurement data or whether to include only a subset of the measurement data in the archive (e.g. the last 30 days).

2.12 Troubleshooting

This section explains how to handle common issues.

2.12.1 DHCP Addresses

A periodical discovery is recommended if instrumentation to the hosts with DHCP assigned addresses has been made. Periodical polling rely on cashed IP address which might change by DHCP.

2.12.2 Old Database Restore

An old database might contains orphan data for some configurations. It might take some time before orphan data will be detected and corresponding actions will expire due to exceeding limits of failures.

3 Software Usage Metering

This chapter describes how to define filter rules for tracking of desired software and how to enable / disable software usage metering for selected devices.

3.1 Concepts

The workflow consists of the following steps.

- *Manage Software Templates*
  Software templates contain filters and conditions that identify desired software / processes.
- *Assign Templates To Computers*
  To enable software usage metering, templates are assigned to computers and the sampling interval and expiration date is configured.
- *Reset Template Assignments On The Computers*
  To disable software metering on Windows computers, assigned templates are reset which will stop ongoing metering of software.
- *Periodic Discovery To Get Software Usage Data*
  With each discovery, software usage data is collected from computers on which software metering templates are configured.

The *sampling interval* defines how often running processes are polled. The shorter the sampling interval, the more accurately running software is tracked, but it also creates more load on the computer.

The *expiration date* defines how long running processes are polled. All software metering data temporarily stored on Windows computers is automatically deleted when the *expiration date* has lapsed.

3.2 Data Structure

JDisc Discovery stores software metering events from devices in the database. Software metering event attributes such as start and stop time, the filter name that matched the process and process details including the binary name, path and parameters.

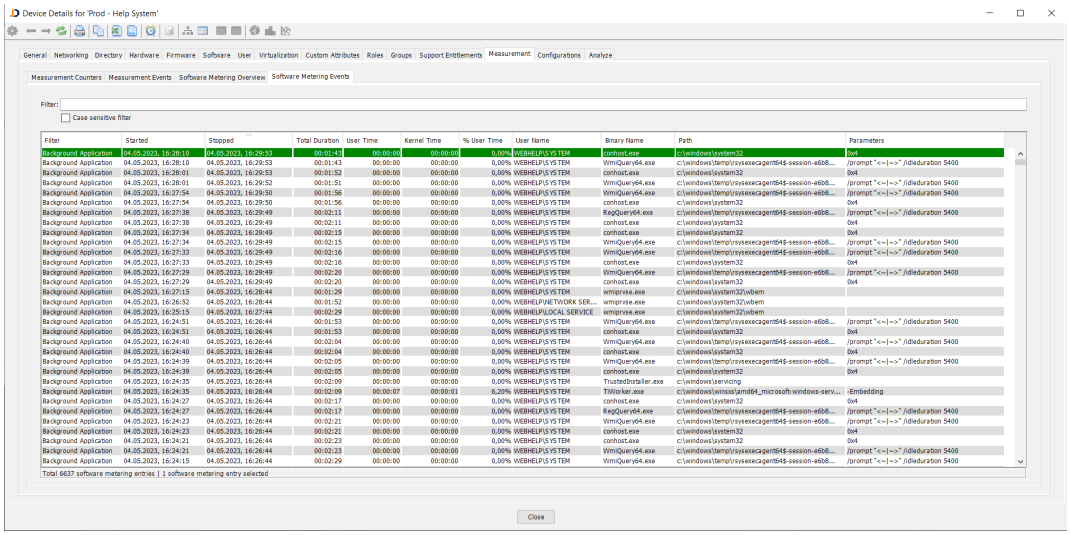

Figure: Software Metering Events

3.3 Dependencies

Software usage metering requires the JDisc Discovery Zero-footprint agent on Windows computers. Software usage data is collected and filtered by the following executable:

- SoftwareUsageQuery32.exe on 32-bit Windows
- SoftwareUsageQuery64.exe on 64-bit Windows

The JDisc Discovery Zero-footprint agent runs the corresponding executable until the e*xpiration date* is reached.

Please make sure the Windows Remote Login protocol is enabled. Otherwise the software usage metering will not work.

3.4 Manage Software Templates

Software metering templates can contain multiple filters. A filter can have multiple conditions to match process details. A condition can match process details such as binary name, parameters, etc.

To manage software templates, click the *Measurement » Software Usage Metering » Manage Software Templates* menu item.

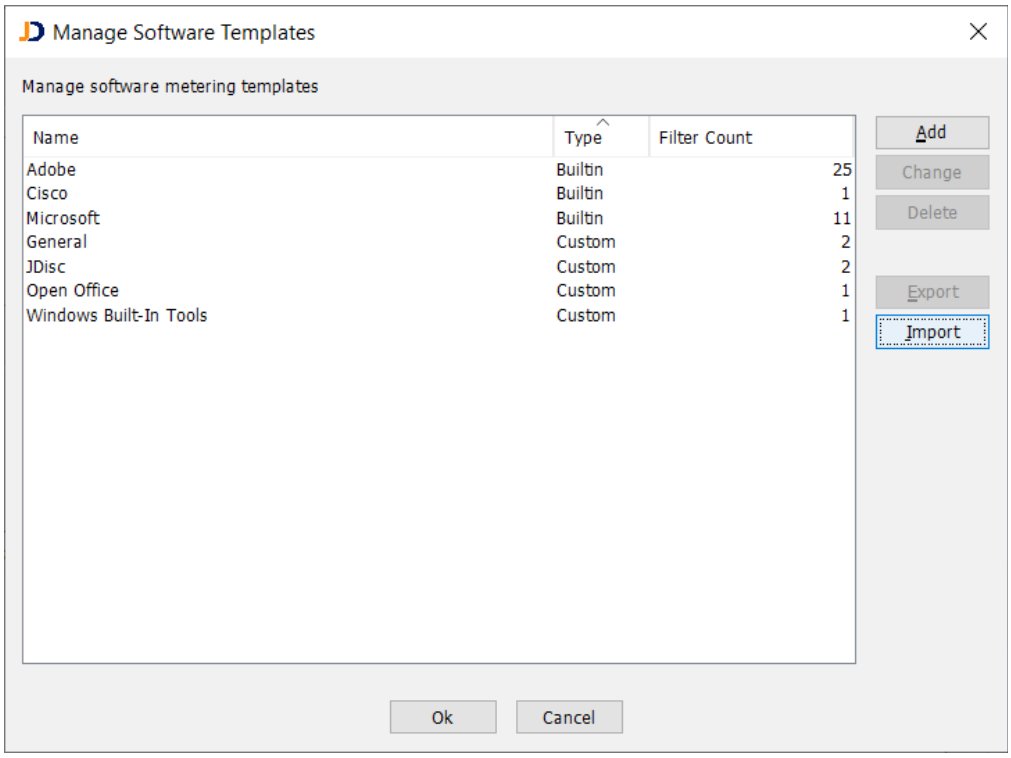

Figure: Manage Software Templates

Software metering templates help structuring software metering filters and conditions. A template can contain all the filters needed to identify applications in packages such as Microsoft Office or Open Office.

There are two types of software metering templates:

- Builtin – Delivered and updated with the Measurement Add-On (Immutable).
- Custom – Customer defined (Can be added, modified and deleted.)

Software templates can be used to build libraries of software detection filters and conditions, which can be exported and imported into other JDisc Discovery installations. Click the *Export* and *Import* buttons from the *Manage Software Templates* dialog to export software templates to file or import software templates from file.

3.4.1 Manage Software Filters

Software filters can contain one or more conditions that match process attributes such as binary name, description, manufacturer, etc. and associate them with a software name.

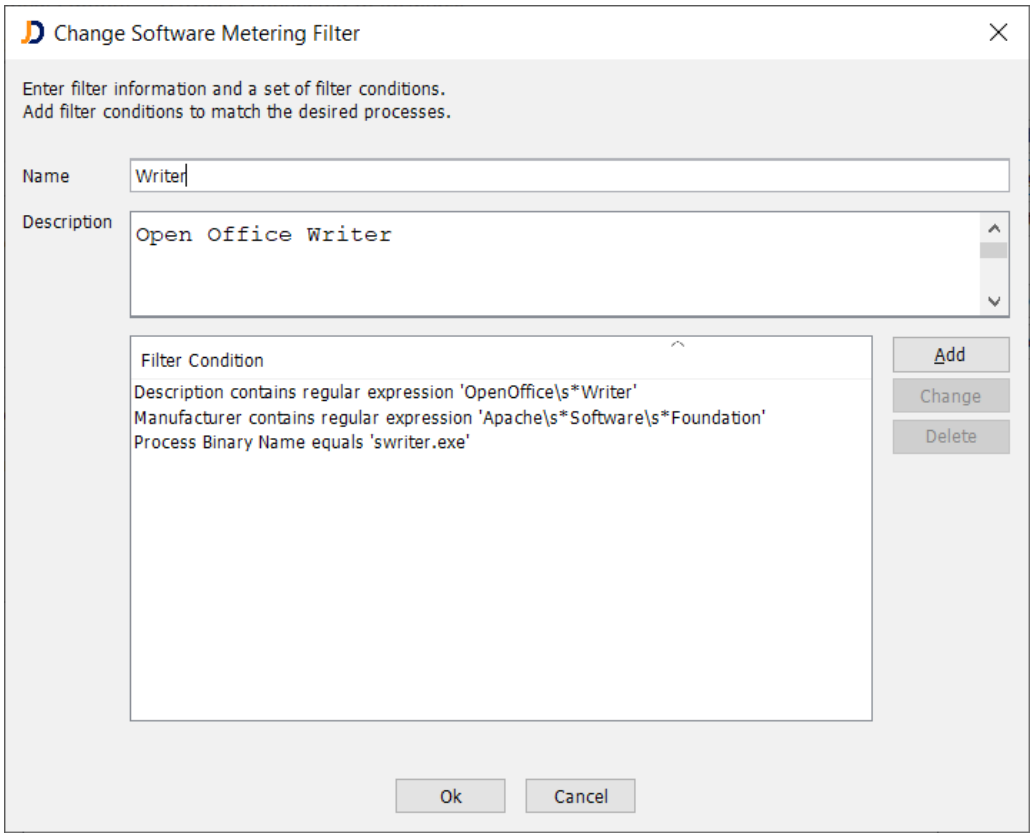

Figure: Change Software Metering Filter

3.4.1.1 Process Attributes

The process attributes described table below can be used as filter criteria.

- **Binary Name** [String]: The executable name (i.e. swriter.exe)
- **Manufacturer** [String]: The manufacturer (i.e. Apache Software Foundation) contained in the meta information of the executable.
- **Product Name** [String]: The product name contained in the meta information of the executable.
- **Version** [String]: The version contained in the meta information of the executable.
- **Description** [String]: The description contained in the meta information of the executable.

- **Process Parameters** [String]: The description contained in the meta information of the executable.
- **Process Path** [String]: The path of the executable
- **User Name** [String]: The user name (i.e. JENKINS\ADMINISTRATOR) that started the process.
- **User SID** [String]: The user SID (i.e. S-1-5-21-3959766114-3533184944-2148295894-500) that started the process.
- **Session ID** [Integer]: The Session ID of the process
- **File Size** [Integer]: The file size (Bytes) of the executable

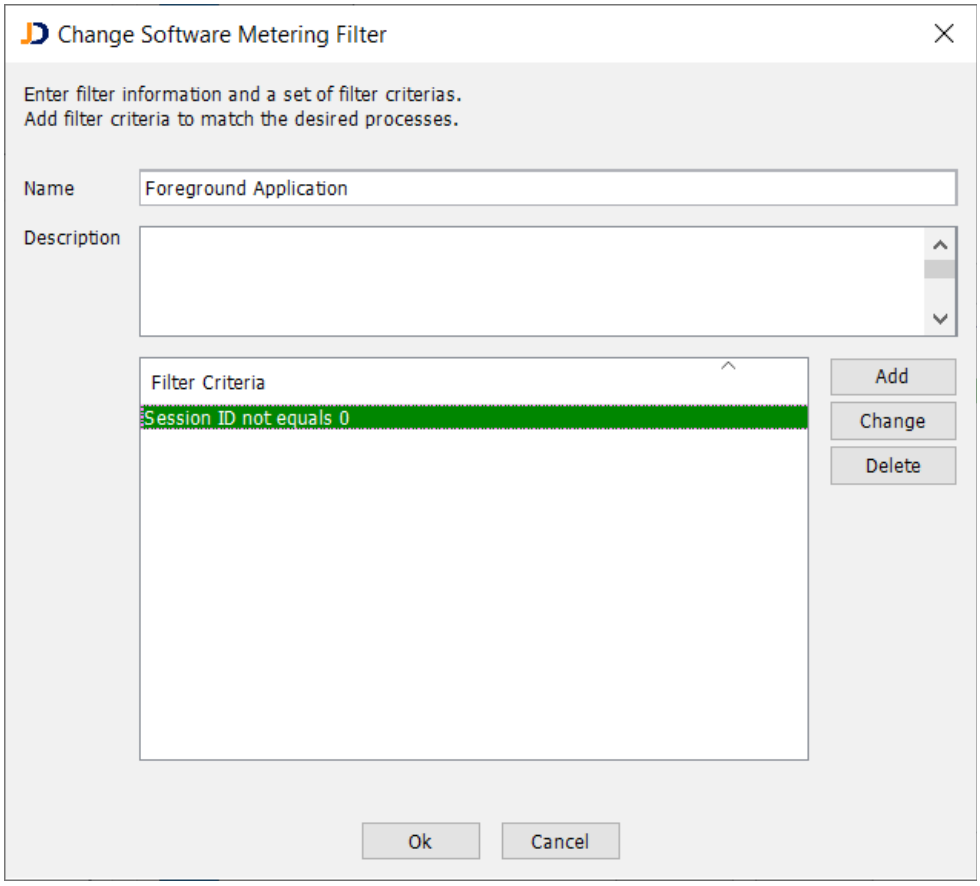

Figure: Change Software Metering Filter using an integer attribute

3.4.1.2 Filter Operators

The attributes described in the previous chapter can be used to match using the following operators:

String Operators:

- **contains**: True if a process attribute contains the specified string (i.e. swriter.exe).

- **contains regular expression**: True if a process attribute contains the specified regular expression (i.e. OpenOffice\s*Writer).
- **ends with**: True if a process attribute ends with the specified string (i.e. exe).
- **equals**: True if a process attribute equals the specified string (i.e. swriter.exe).
- **matches regular expression**: True if a process attribute matches the specified regular expression (i.e. OpenOffice\s*Writer).
- **starts with**: True if a process attribute starts with the specified string (i.e. swriter).

Integer Operators:

- **equals**: True if a process attribute equals the specified value.
- **greater than**: True if a process attribute is greater than the specified value.
- **greater than or equal:** True if a process attribute is greater than or equal the specified value.
- **less than**: True if a process attribute is less than the specified value.
- **less than or equal**: True if a process attribute is less than or equal the specified value.
- **not equals**: True if a process attribute is not equal the specified value.

3.5 Assign Templates To Computers

The software metering process is started by assigning one or more software templates to a computer.

Click the *Measurement » Software Usage Metering » Software Metering Deployments* menu item to display computers having software metering templates assigned and deployed.

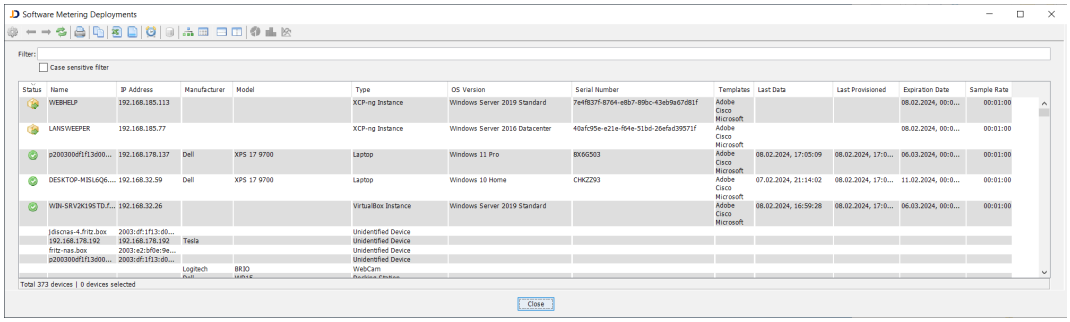

Figure: Software Metering Deployments

The *Software Metering Deployment* report also displays the *Last Data* date when software metering data has been imported the last time but also the *Last Provisioned* date, *Expiration Date* and *Sample Rate*.

To enable software metering, select one or multiple Windows computers in any device report and click *Software Metering » Assign Templates* from the context menu.

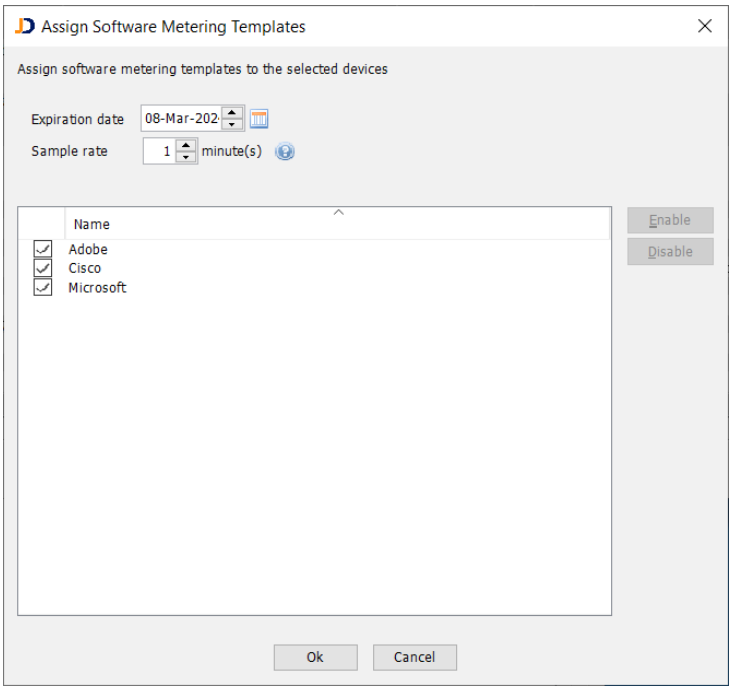

Figure: Assign Software Metering Templates

In the *Assign Software Metering Templates* dialog box, enable software metering templates and configure the *Expiration Date* and *Sample Rate*.

After assigning software metering templates to a computer, its status changes, but the actual software metering process has not yet started which is indicated by the empty *Last Data, Last Provisioned* column and the *Status* icon.

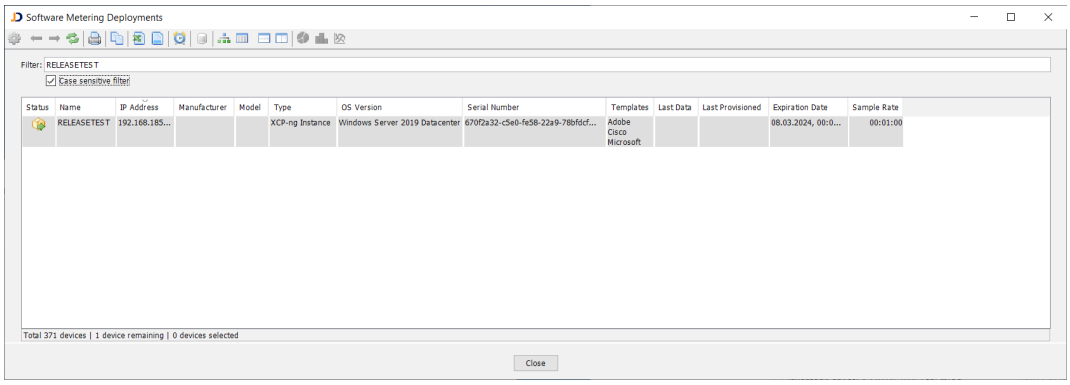

Figure: 'Fresh' Software Metering Deployments

Software metering is activated at the next discovery and the selected templates are transferred (provisioned) and the *Last Provisioned* date, *Expiration Date* and *Sample Rate* are configured.

3.6 Reset Template Assignments On Computers

To disable software metering, select one or multiple computers from the *Software Metering Deployments* report that are enabled and click *Software Metering » Reset Template Assignments* from the context menu.

After resetting assigning templates, the status will change, but the actual software metering process will not yet stop. The software metering process will be stopped the next time the computer is discovered.

3.7 Periodic Discovery To Pull Software Usage Data

The collection of software usage data works autonomously on enabled computer. Collected software usage data is cached until the E*xpiration Date* is reached or the discovery pulls the data.

Configure the discovery to run on a scheduled basis or consider using directory logon scanning to pull software usage data from computers.

3.8 Reporting

The built-in reports include an overview of computers enabled for software usage metering, but also a categorization of software usage data by filter and template names and the associated computers.

3.8.1 Software Metering Deployments

Click the *Measurement » Software Usage Metering » Software Metering Deployments* menu item to display computers that already have templates deployed.

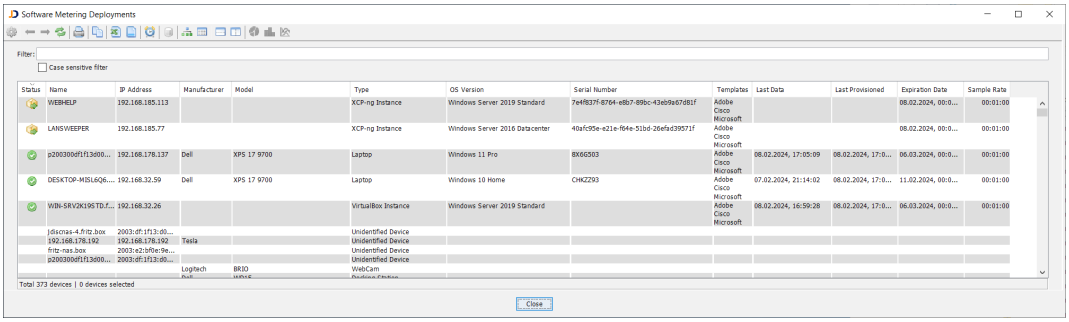

Figure: Software Metering Deployments

3.8.1.1 Deployment Troubleshooting

The *Status* column of the *Software Metering Deployments* report provides details on the state of the software metering process.

Status	Description
	Software metering templates are assigned and the metering is deployed.
	Software metering templates are assigned but the software metering is not yet deployed.
	Software usage data is avaliable but there are no (more) software metering templates assigned.
	Software metering templates are assigned, the metering is deployed, some software usage data is available but no more “fresh” software usage data has arrived for more than 4 weeks.

Table: Software Metering Deployment Status

The *Last Provisioned* column indicates the time when software metering templates were last transferred and activated on the target computer. If this field is empty the target computer either has not been discovered since templates were assigned or the discovery failed to properly discover the computer due to access / credential issues.

3.8.2 Software Metering Filters

Click the *Measurement » Software Usage Metering » Software Metering Filters* menu item to display a categorization of software usage data by filter and template name and the related computers.

Double clicking on a line opens a new report window displaying computers related to the selected template and filter.

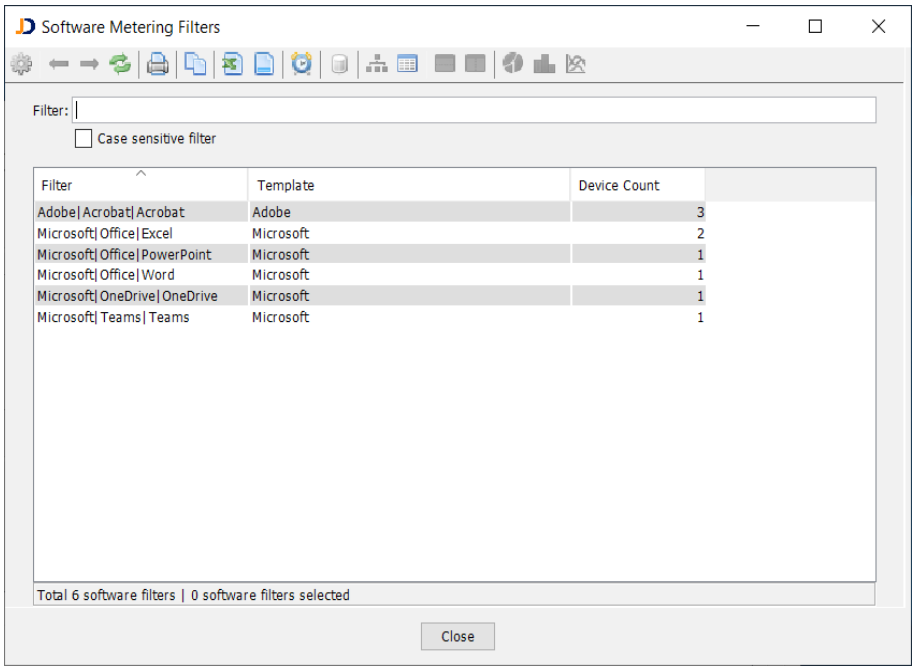

Figure: Software Metering Filters

3.8.3 Software Metering By Device

The *Software Metering Overview* report shows all software metering events categorized by filter and user name for a device.

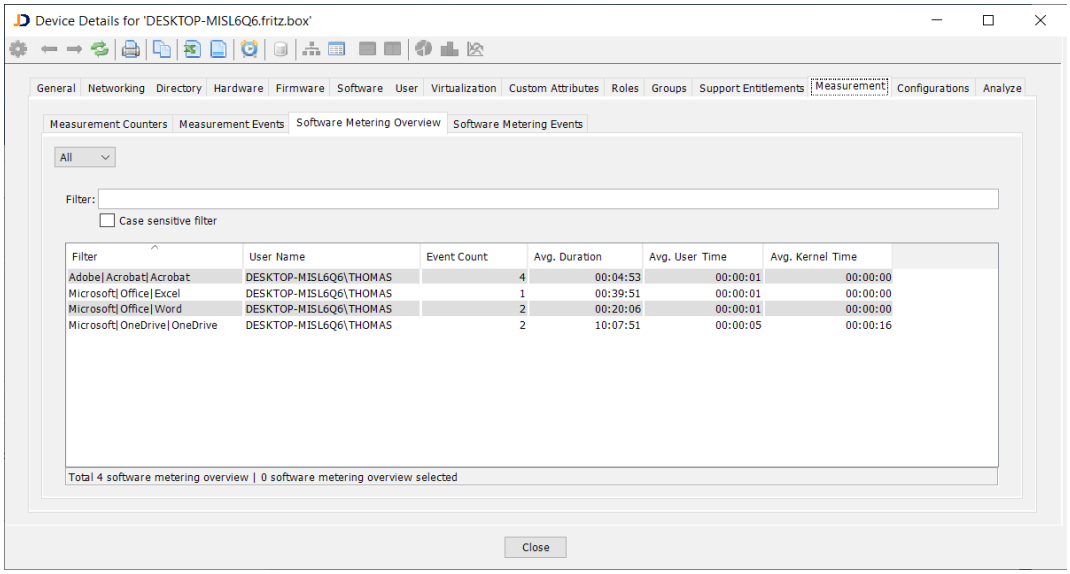

Figure: Software Metering Overview / All

The *Average Duration*, *User Time* and *Kernel Time* columns display the average values for all metering events per filter and user name.

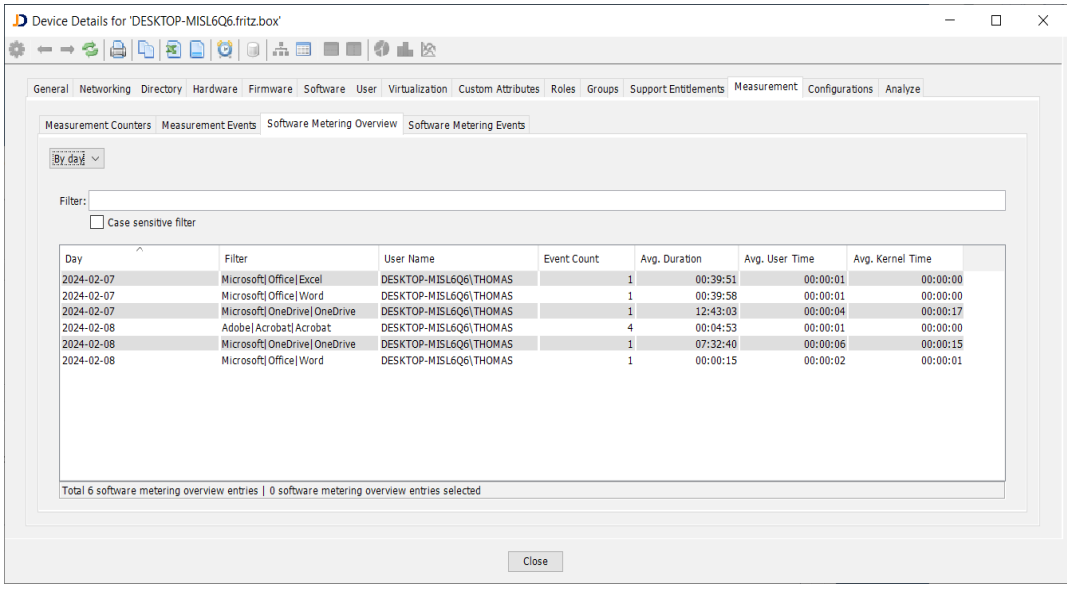

Figure: Software Metering Overview / By day

With the *By day* filtering, all metering events per day are displayed according to filter and user name.

The *Software Metering Events* report shows all software metering events for a device including event details such as process name, parameters, etc.

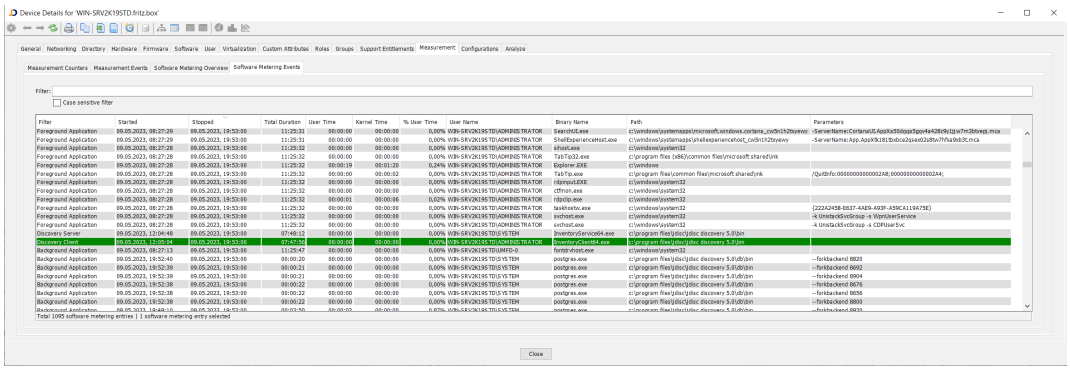

Figure: Software Metering Events