KOFAX

Methodology for Performance and Longevity Testing of Kofax Export Connectors

Product Name: **KOFAX EXPORT CONNECTORS**

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Document Revision History:

Date	Revision	Description	Author
03/01/2013	1.0	Initial Draft -	Rodolfo Gordillo
04/18/2013	1.0	Draft for review.	Rodolfo Gordillo
06/27/2013	2.0	Address team comments	Rodolfo Gordillo
04/24/2014	2.1	Added reference to PAL log analysis tool	Bill Halal

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Environments Supported

- .NET 3.0, 3.5, 4.0, 4.5
- ASP.NET, ASP.NET MVC, Windows Forms, WPF, Silverlight
- Visual Studio 2005, Visual Studio 2008, Visual Studio 2010, Visual Studio 2012, Visual Studio 2013, Visual Studio 2015
- Windows 2003 Server, Windows 2008 Server, Windows Server 2012
- C#, VB.NET, F#
- 32-bit, 64-bit
- Browsers supported include IE8+, Firefox, Chrome, Safari, Mobile Safari, Android Chrome

Licensing

Development

- The development SDK includes a license for a single named developer. Each additional developer requires a developer/build license (which are 1/2 the cost of an SDK license)

Deployment

- **Server License** – Server licenses are required when deploying a server or web application. Server licenses are also required for service applications that accept connections from other machines or for headless processes that watch folders or other datasources for work originating from other machines. Each production server requires its own license
- **Unlimited Server Deployment** – This annual agreement would allow for unlimited server deployment per application and SDK licenses for the application development team for a low annual fee
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1. Overview

The purpose of this document is to detail the performance methodology currently used to assess the performance of Kofax Export Connectors.

## 2. Configuring the Test Driver

2.1   Overview

This machine serves as the performance test controller. The test driver machine is in charge of generating workload, executing performance scripts and monitoring real time performance across all KC components. The following tools are utilized in the Test Driver machine:

- KPSG Auto Import – Watch Folder Filler
- Windows Performance Monitor
- Performance generation scripts
- Testing Bed

### 2.2   KPSG Auto Import –Watch Folder Filler

This application was developed by the Kofax professional services group and it is in charge of generating a testing workload. It allows us to create large document workloads based on sample documents.
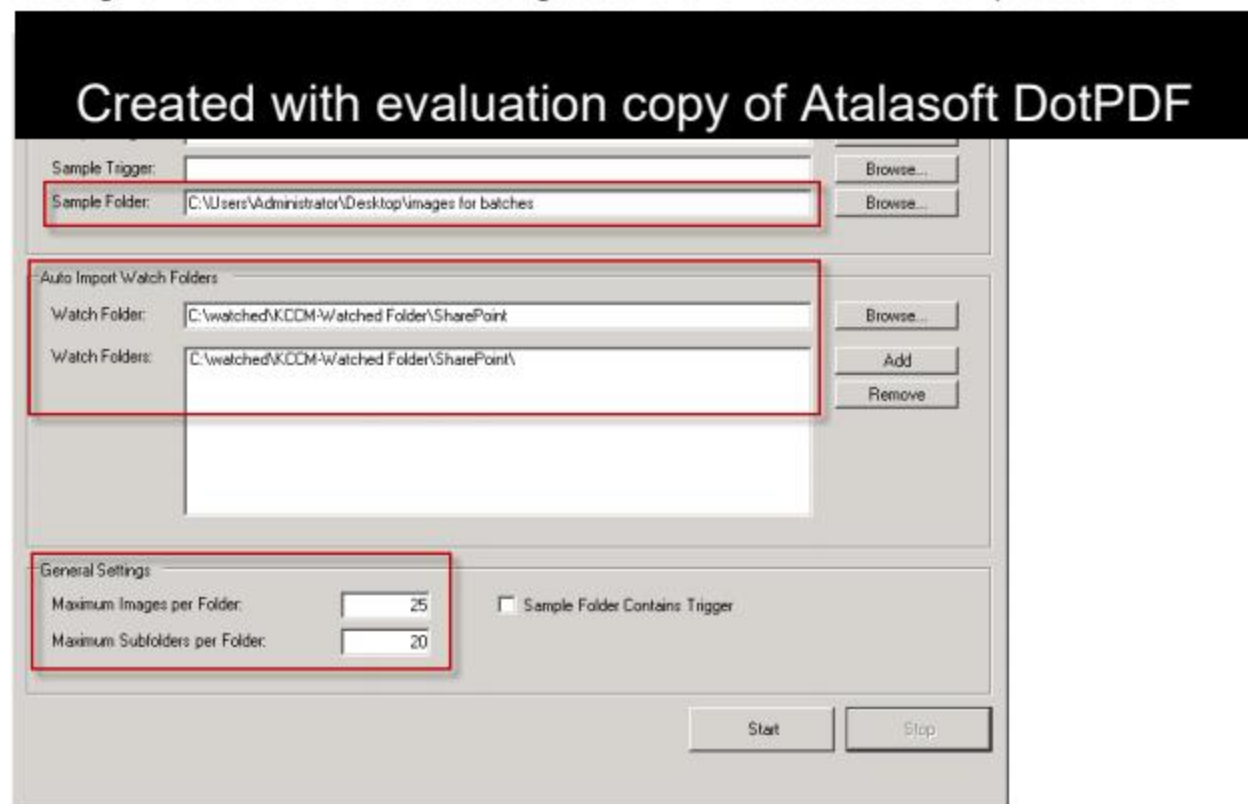
The sample folder refers to the folder that contains the document images. The watch folder refers to the folder that holds the copies of the sample folder. The maximum image per folder parameter refers to the maximum amount of images that we would like to place in each copy of the sample folder. The Maximum subfolder per folder parameter refers to the amount of copies that we would like to make of the sample folder.
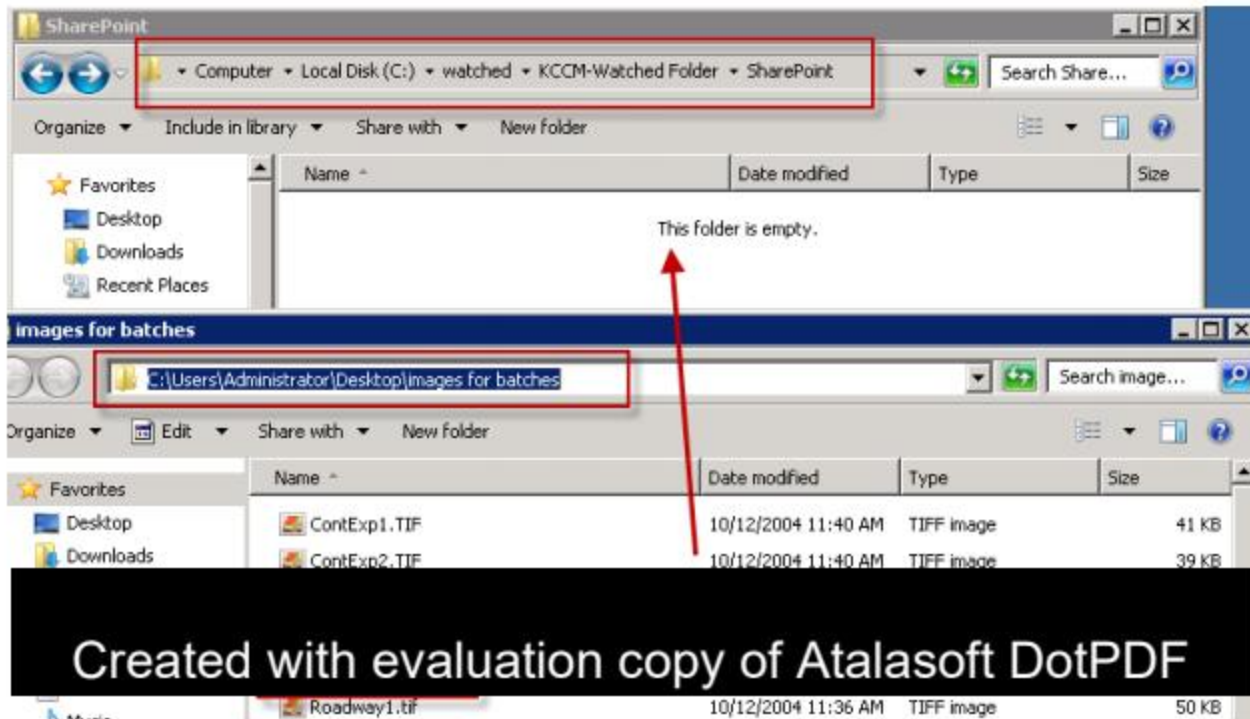
After the watch folder filler is started, various copies of the sample folder are placed on the watched folder.
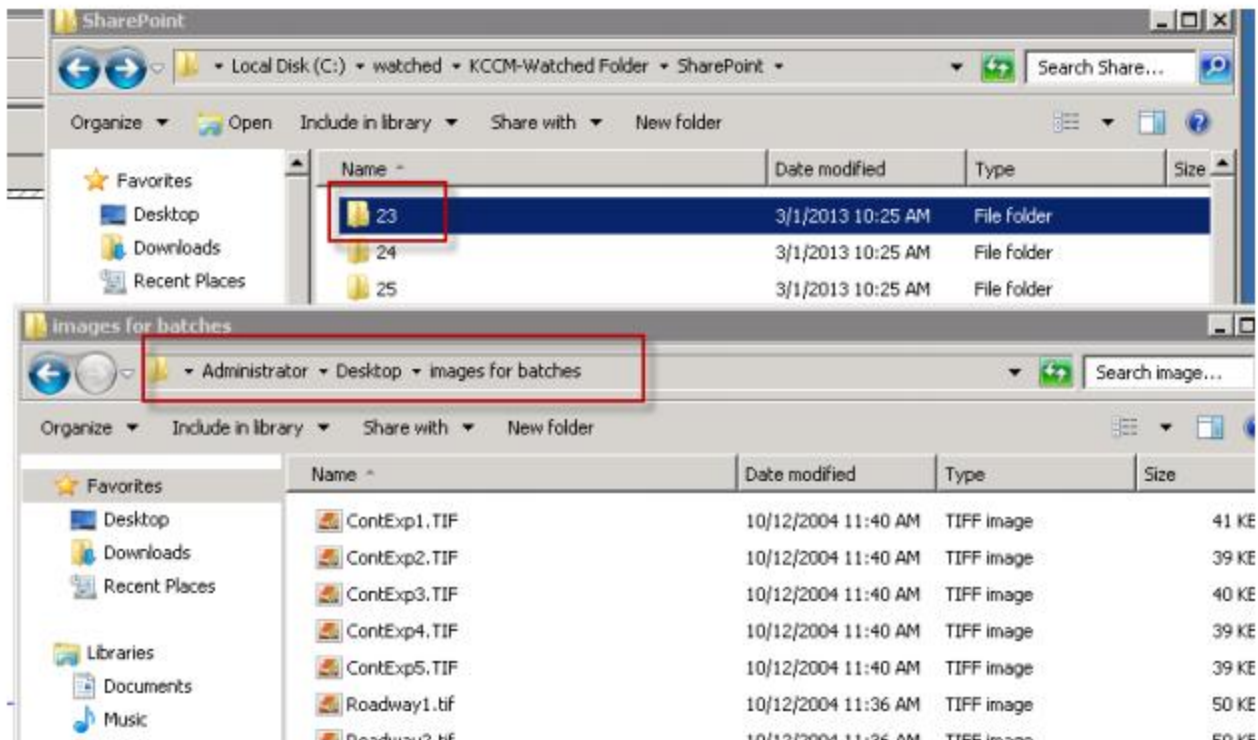
2.3   Windows Performance Monitor

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The Windows Performance Monitor can be configured manually but in order to make the configurations consistent we utilize the performance test scripts detailed in section 2.4.
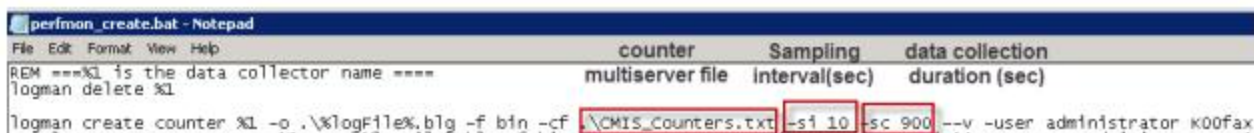
2.4   Performance Test Scripts

Various test scripts have been developed to execute the performance tests. These scripts have to be modified in order to suit the particular needs of the performance component to be tested.

The scripts are located
on: \\sqafs\AscentSQAProjects\Performance\Kofax_Export_Connectors\Test_driver_scripts

2.4.1 Perfmon_create.bat

This script creates a data collector on Windows performance Monitor based on the counters described in the (Export Connector)_Counters.txt file. Sampling interval and the time interval in which vitals are collected can be modified in this script.

```
perfmon_create.bat - Notepad
File  Edit  Format  View  Help
                                                      counter       Sampling      data collection
REM ===%1 is the data collector name ====          multiserver file  interval(sec)  duration (sec)
logman delete %1

logman create counter %1 -o .\%logFile%.blg -f bin -cf .\CMIS_Counters.txt -si 10 -sc 900 --v -user administrator KOOfax
```

This script is typically called by the perfmon_start.bat script.

2.4.2 Perfmon_filter_NoStartEnd.bat

2.4.3 Perfmon_(start/stop).bat

Starts and stops collecting performance vitals. It utilizes the Perfmon_create.bat script.

2.4.4   (Start/Stop)_ExportServices.bat

Starts and stops the exporting services on the KC export station.

2.4.5   (Start/Stop)_KofaxServices.bat

Starts and stops the Recognition and PDF Generator services on the KC workstations.

2.4.6 (Start/Stop)_Test.bat

Starts and stops the Scan services on the scanning station.

2.4.7 (Start/stop)WinServiceRemote.bat

This script starts and stops windows services remotely. It is not called directly but through the KofaxServices, Export Services and Test scripts.

2.4.8 counters_multiservers_(ExportConnector).txt

This text file contains the counters to be used to create a data collector in the Windows Performance Monitor.

2.4.9 filter_cpu_multiservers_(ExportConnector).txt

This text file contains the set of counters utilized to filter the counters collected with the Windows Performance Monitor. It is a subset of the counters_multiservers_(ExportConnector).txt file.

2.4.10   copyKCLogs.bat

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sqaperfrpt.pl script to measure the throughput of the system.

2.4.11   deleteKCLogs.bat

This script deletes the Capture logs from the CaptureSV folder in the KC Server. It must be executed before every test.

2.4.12   sqaperfrpt.pl

This is a Perl script that is utilized to obtain statistical data after a performance test run has been executed. It takes as an input a Kofax Capture Log file with the following syntax

    Perl sqaperfrpt.pl <NumberOfBatchesToProcess>   <KCLogFile> <TempProcessedFile>
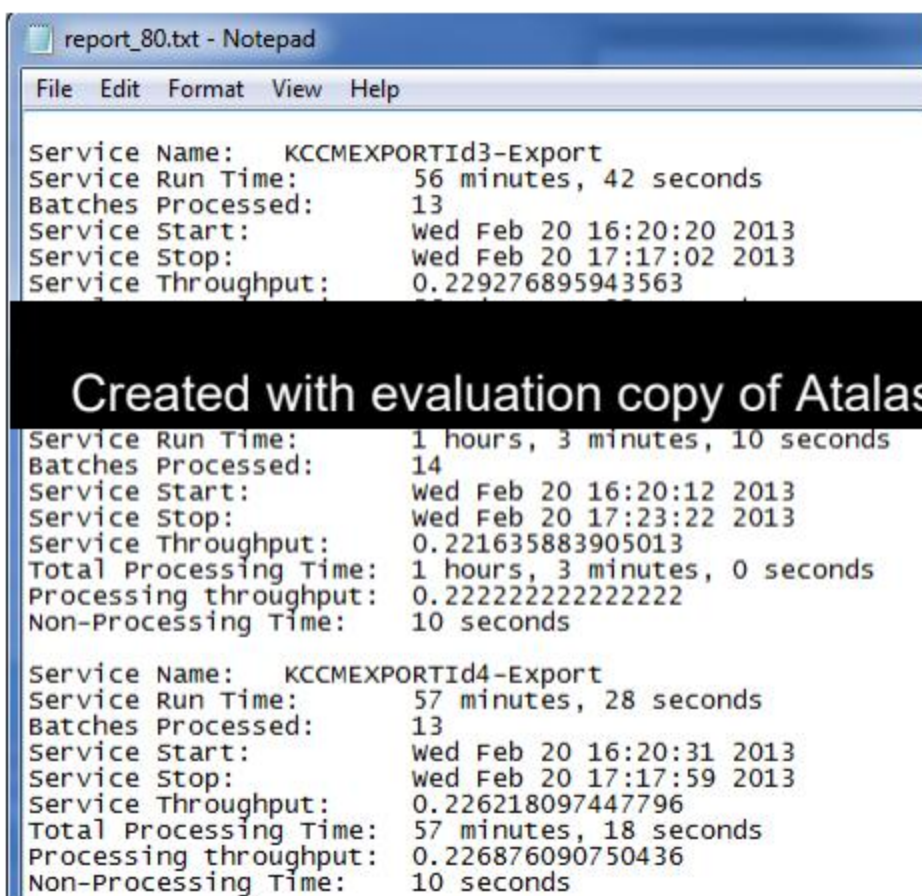   <ReportOutputFile>

For example if we wanted to provide a report of the first 80 batches processed by the system we would type:

```
C:\Logs to be Processed\KEC-CMIS>perl sqaperfrpt.pl 80 log_1302.txt processed.txt report_80.txt
```

The progress in the script would look similar to this:

```
Processing only first 80 batches.
Input file:     log_1302.txt
Processed file will be: processed.txt
Report file will be: report_80.txt
Start Time: Wed Feb 27 17:23:44 2013
Processing data....
Finished processing, processed data written to processed.txt
Gathering data...
Sorting by Time.....
Sorting by Module....
Calculating E2E performance...
Gathering module start/stop times...
Calculating Individual Service Throughput...
Report finished: report_80.txt
End time: Wed Feb 27 17:23:44 2013
```

Once the script has completed we need to open the report_80.txt file and observe the processed data statistics presented for each Kofax Service:
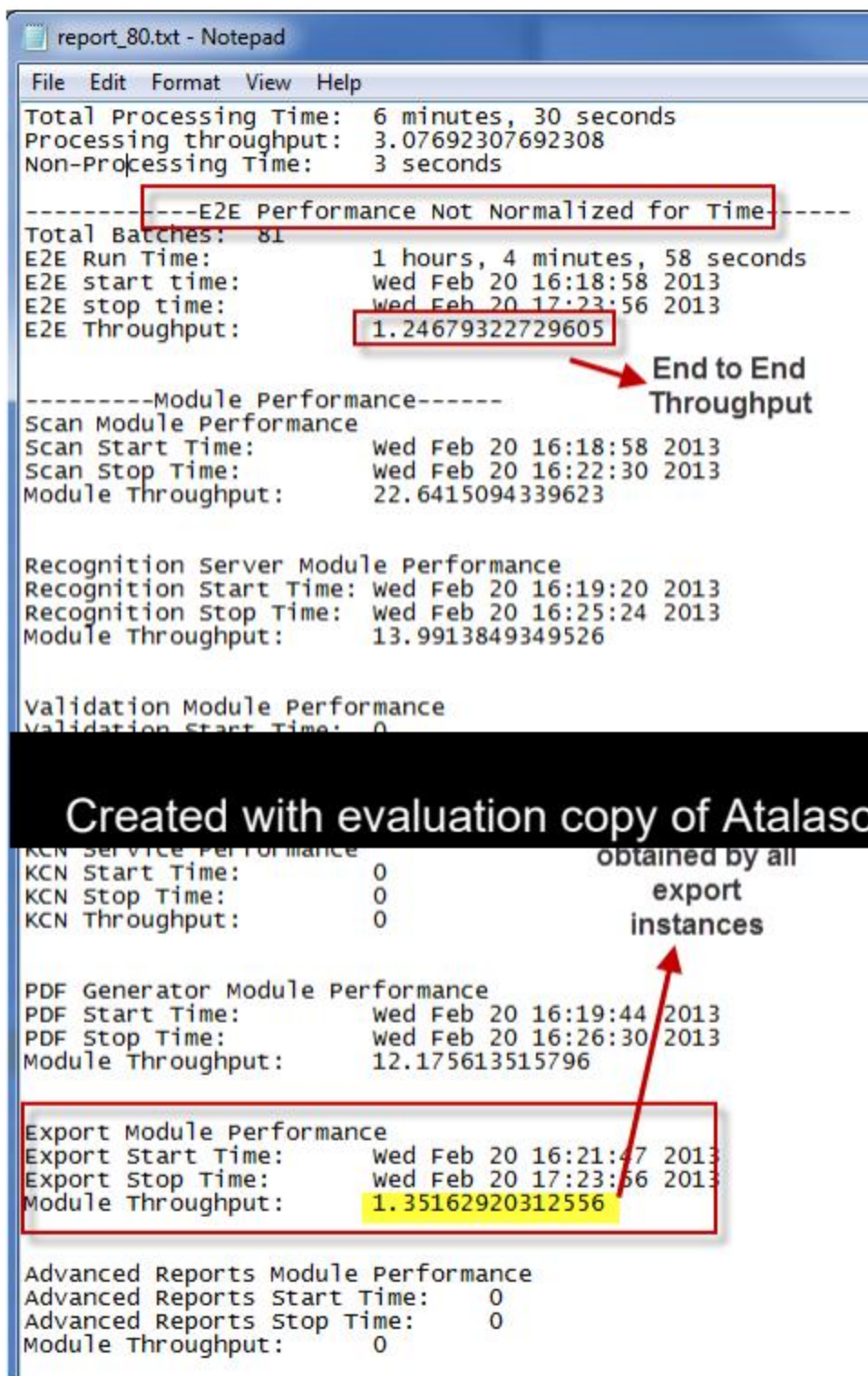
```
report_80.txt - Notepad

File   Edit   Format   View   Help

Service Name:      KCCMEXPORTId3-Export
Service Run Time:        56 minutes, 42 seconds
Batches Processed:       13
Service Start:          Wed Feb 20 16:20:20 2013
Service Stop:           Wed Feb 20 17:17:02 2013
Service Throughput:     0.229276895943563
```

```
Service Run Time:        1 hours, 3 minutes, 10 seconds
Batches Processed:       14
Service Start:          Wed Feb 20 16:20:12 2013
Service Stop:           Wed Feb 20 17:23:22 2013
Service Throughput:     0.221635883905013
Total Processing Time:  1 hours, 3 minutes, 0 seconds
Processing throughput:  0.222222222222222
Non-Processing Time:    10 seconds

Service Name:      KCCMEXPORTId4-Export
Service Run Time:        57 minutes, 28 seconds
Batches Processed:       13
Service Start:          Wed Feb 20 16:20:31 2013
Service Stop:           Wed Feb 20 17:17:59 2013
Service Throughput:     0.226218097447796
Total Processing Time:  57 minutes, 18 seconds
Processing throughput:  0.226876090750436
Non-Processing Time:    10 seconds
```

At the end of the file we can see the average throughput for all the Kofax services as well as the End to End throughput for the system.

```
report_80.txt - Notepad

File  Edit  Format  View  Help

Total Processing Time:    6 minutes, 30 seconds
Processing throughput:    3.07692307692308
Non-Processing Time:      3 seconds

-------------E2E Performance Not Normalized for Time-------
Total Batches:   81
E2E Run Time:             1 hours, 4 minutes, 58 seconds
E2E start time:           Wed Feb 20 16:18:58 2013
E2E stop time:            Wed Feb 20 17:23:56 2013
E2E Throughput:           1.24679322729605
```

End to End Throughput

```
---------Module Performance------
Scan Module Performance
Scan Start Time:          Wed Feb 20 16:18:58 2013
Scan Stop Time:           Wed Feb 20 16:22:30 2013
Module Throughput:        22.6415094339623


Recognition Server Module Performance
Recognition Start Time: Wed Feb 20 16:19:20 2013
Recognition Stop Time:  Wed Feb 20 16:25:24 2013
Module Throughput:        13.9913849349526


Validation Module Performance
Validation Start Time:  0
```

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```
KCN Service Performance            obtained by all
KCN Start Time:           0              export
KCN Stop Time:            0            instances
KCN Throughput:           0


PDF Generator Module Performance
PDF Start Time:           Wed Feb 20 16:19:44 2013
PDF Stop Time:            Wed Feb 20 16:26:30 2013
Module Throughput:        12.175613515796


Export Module Performance
Export Start Time:        Wed Feb 20 16:21:47 2013
Export Stop Time:         Wed Feb 20 17:23:56 2013
Module Throughput:        1.35162920312556


Advanced Reports Module Performance
Advanced Reports Start Time:      0
Advanced Reports Stop Time:       0
Module Throughput:        0
```

2.5 Testing Bed

An invoice documents batch class has been created with 5 document types. 5 different index fields are extracted from each page. A set of 25 pages has been selected as a test bed.

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3.1   Installation

The Kofax Import connector installer can be found on the electronic fulfillment site:

- Under product name select "Kofax Capture"
- Under version select "2.1.0"
- Click on "find"
- "Kofax Import Connector 2.1.0" should appear in the search results.

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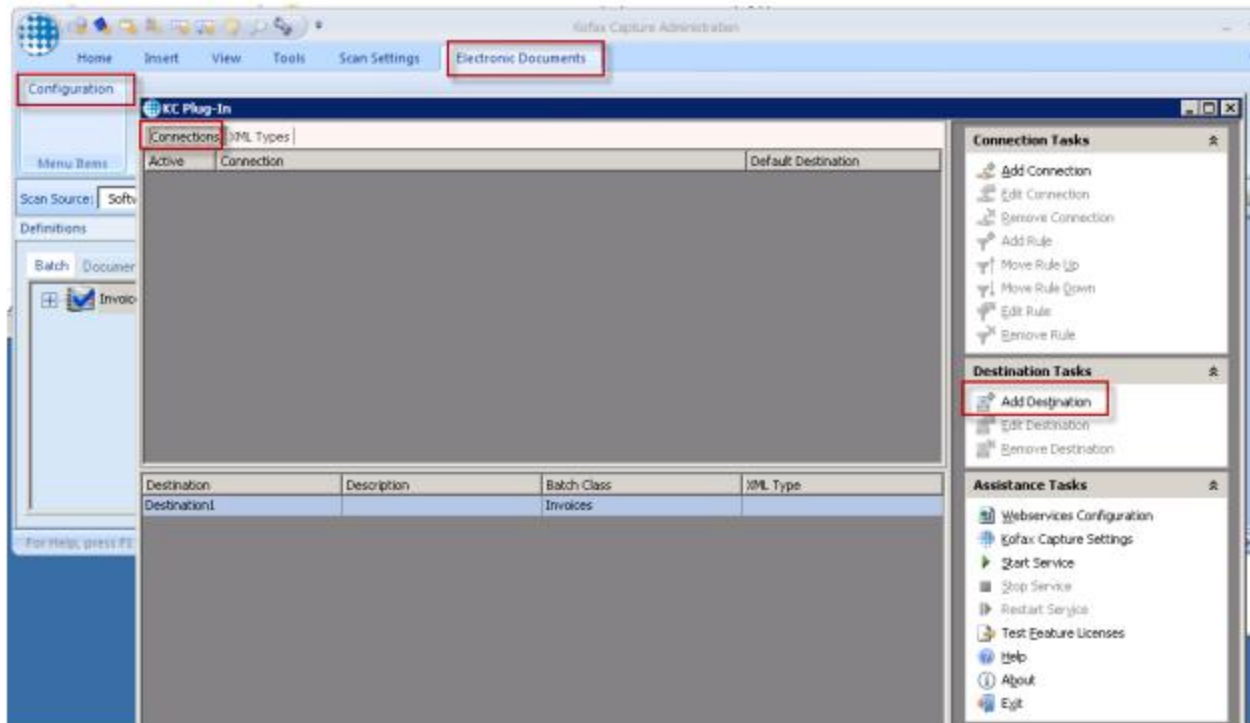
3.2   KC Plugin

Once the installation is complete go to the KC Admin console and select the electronic documents Tab. Open the configuration dialogue:
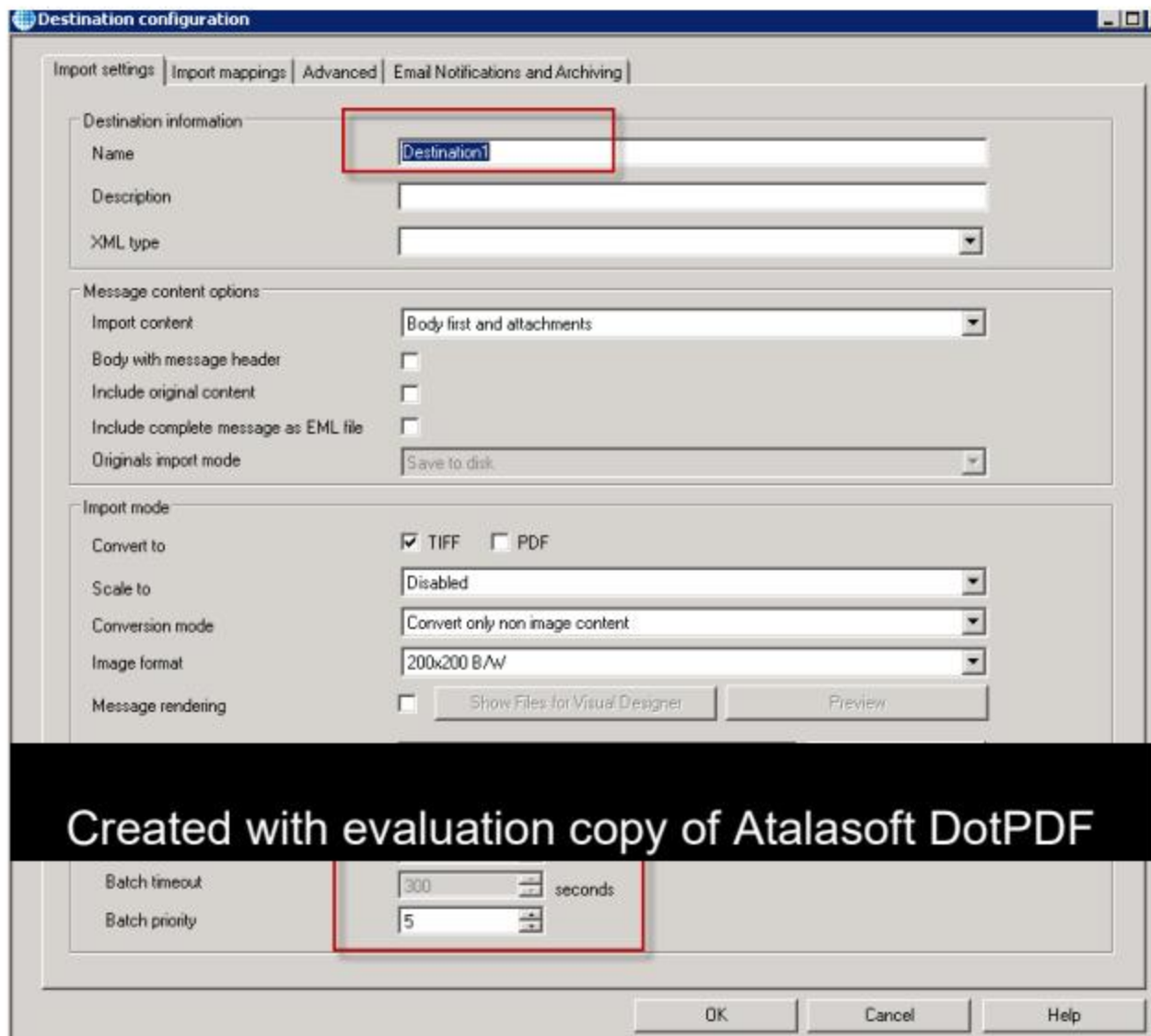
Select the connections Tab and add a destination on the Destination Tasks menu. This will open the

- Set Batch size =1 and Batch priority =5 in the Batch settings

Select the Import Mappings Tab and change the following settings

- Change the Batch Class to Invoices
- Change the Document Class to [Loose Pages – No document will be used]
- Accept the changes and close the Destination configuration dialogue

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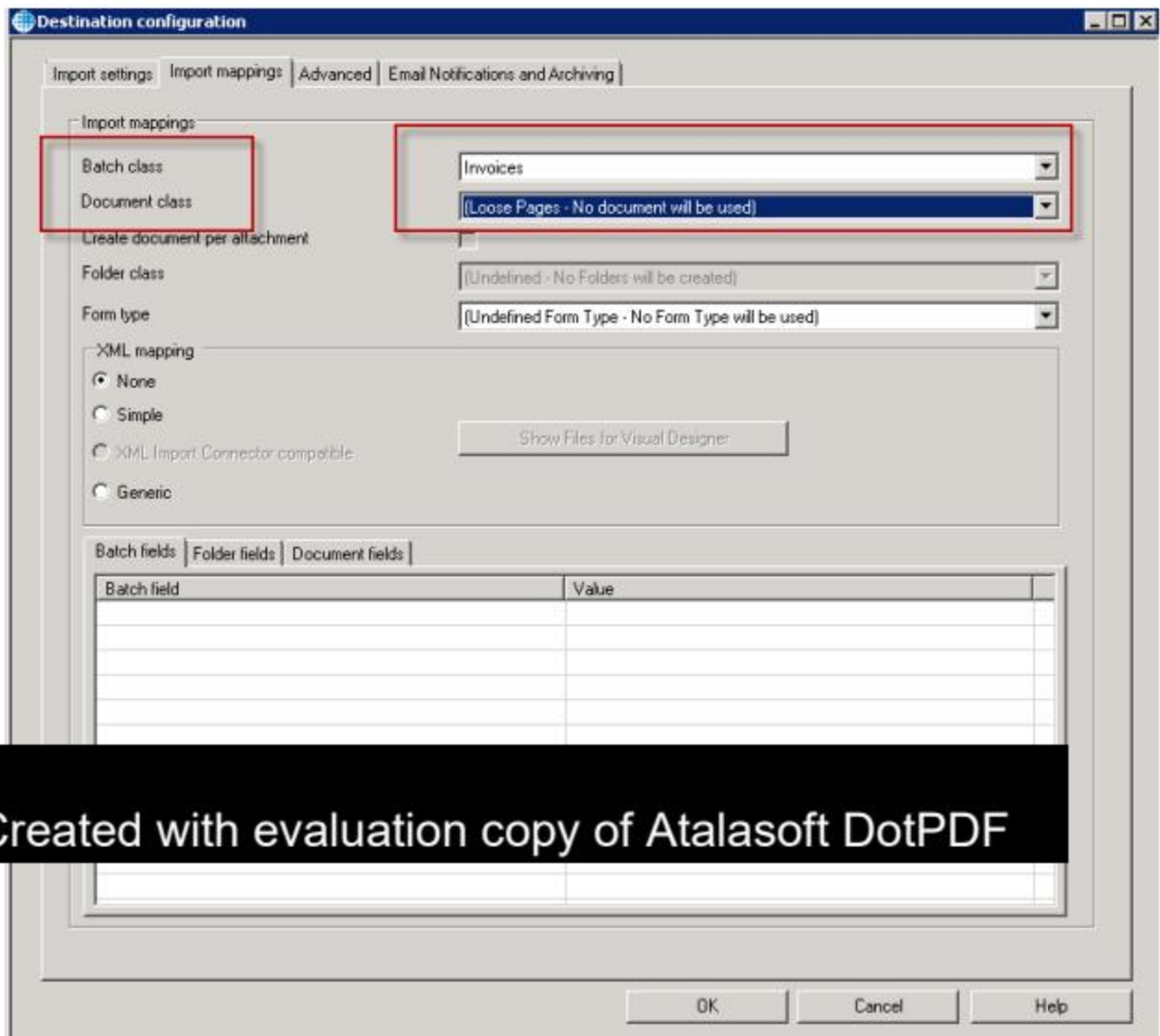
On the Connection tab add a new connection

Once the connection settings dialogue appears change the following:

- Connection Name : Connection1
- Message Connector URL: http://localhost:25086 (note that localhost was used since the message connector is collocated with the KC Plugin.
- Poll interval: 5 seconds
- Default destination: Destination1

Test that the KC Plugin is able to communicate with the message connector that was installed earlier.
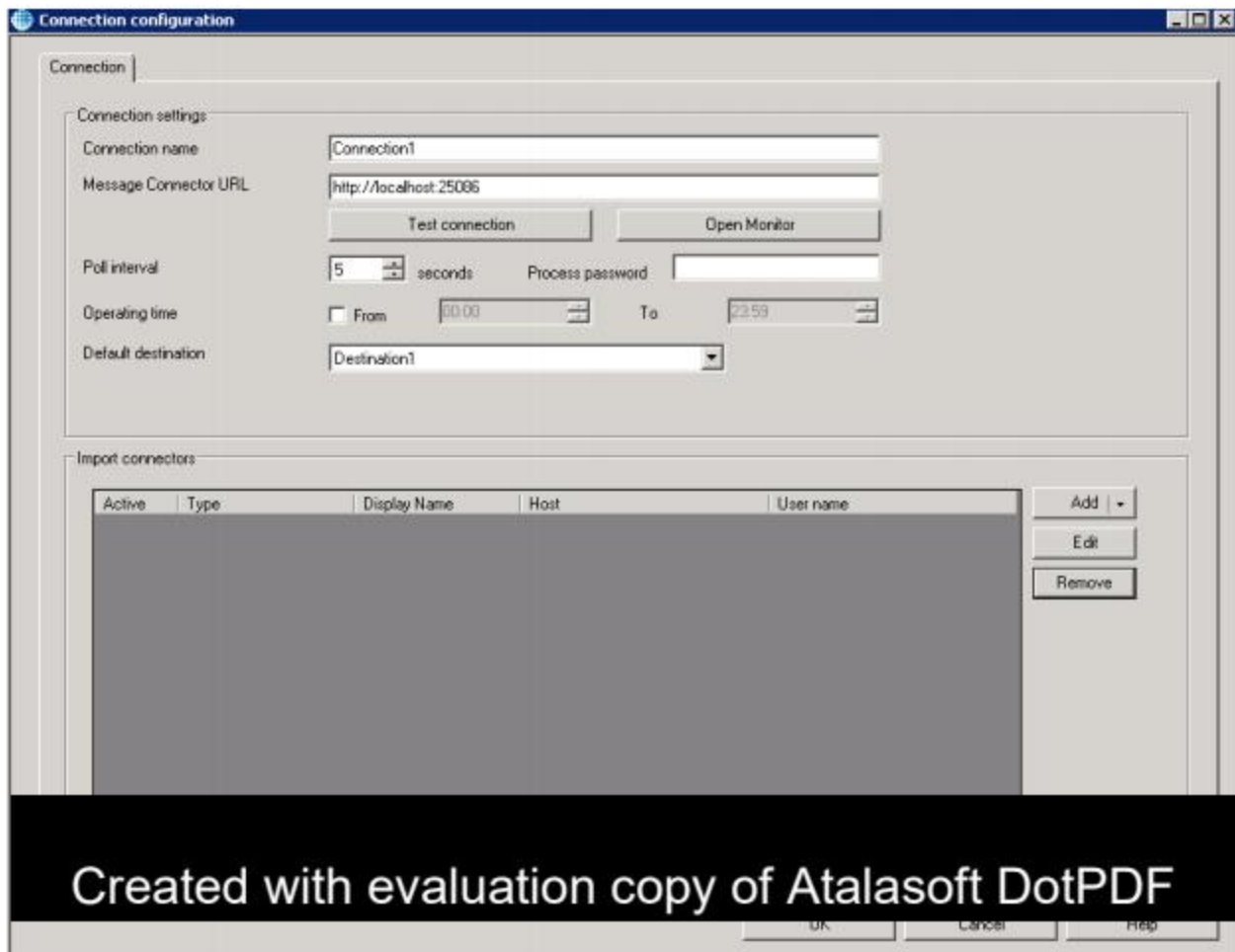
Next we need to add an import connector source. On the import connectors section select add and then Folder Import
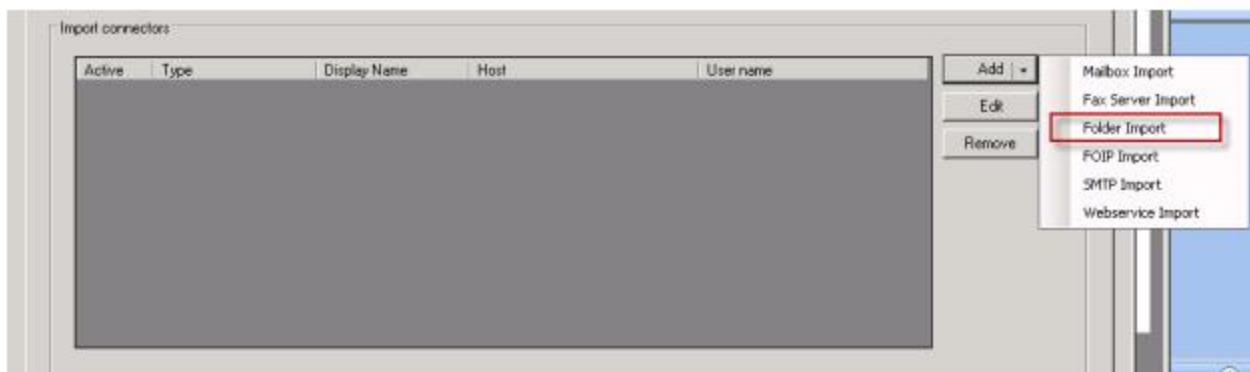
The Folder import settings dialogue will be opened. Set the following

Display name : FolderImport1

Poll cycle in seconds: 5

Watched folder: The location where the watched folder is located (usually in the driver vm hard drive).

User: Administrator

Password: K00fax

Test the folder import setting to make sure that we can access to the watched folder

General | Advanced |

Display name   FolderImport1
Poll cycle in seconds 5
Watched folder   \\kccm-driver\watched\KCCM-Watched Folder   Browse ...
                       A folder on computer KCCM-KIC or UNC path

User   Administrator
Password   ******

KIC-ED-KCPlugIn

Connection to folder \\kccm-driver\watched\KCCM-Watched Folder on KCCM-KIC OK.

OK

Test folder import   OK   Cancel   Help
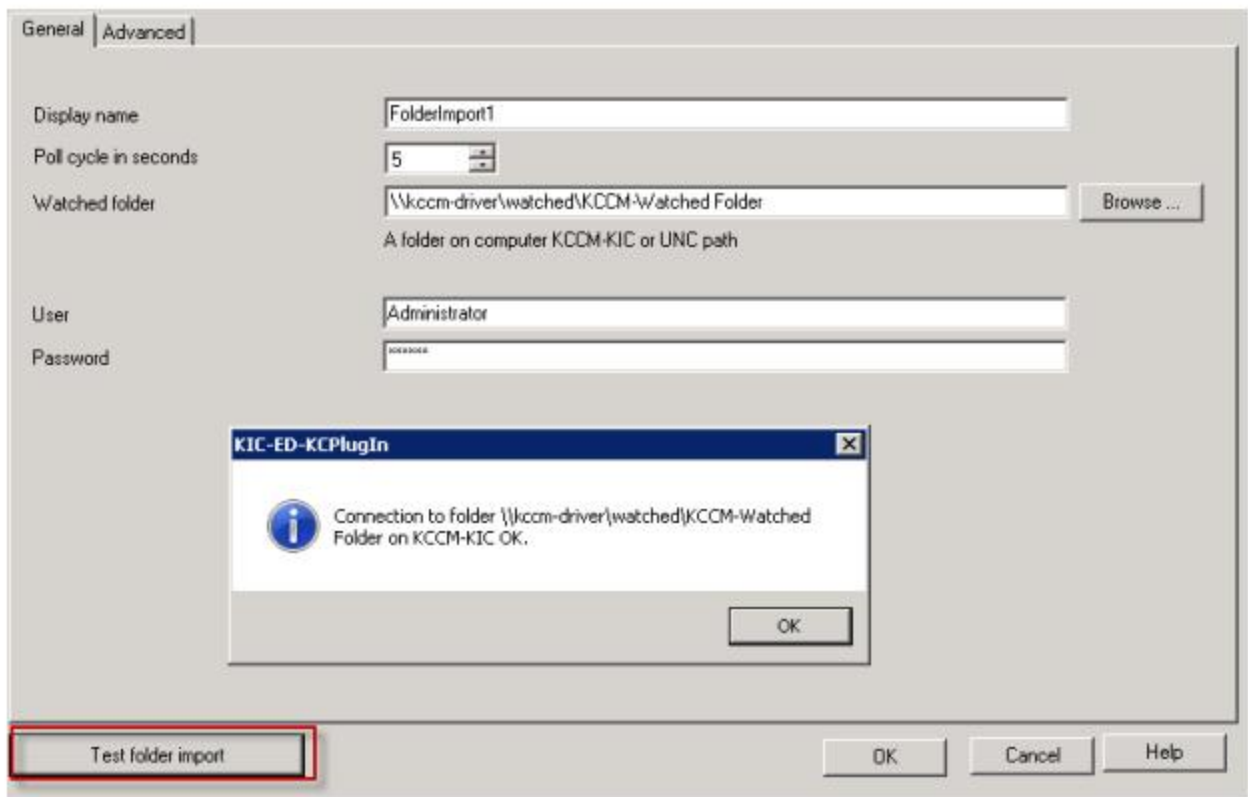
- Set the file trigger mode to use trigger and set the file mask to *.trg
- Select "All files in the same directory" mode
- Select "Delete"
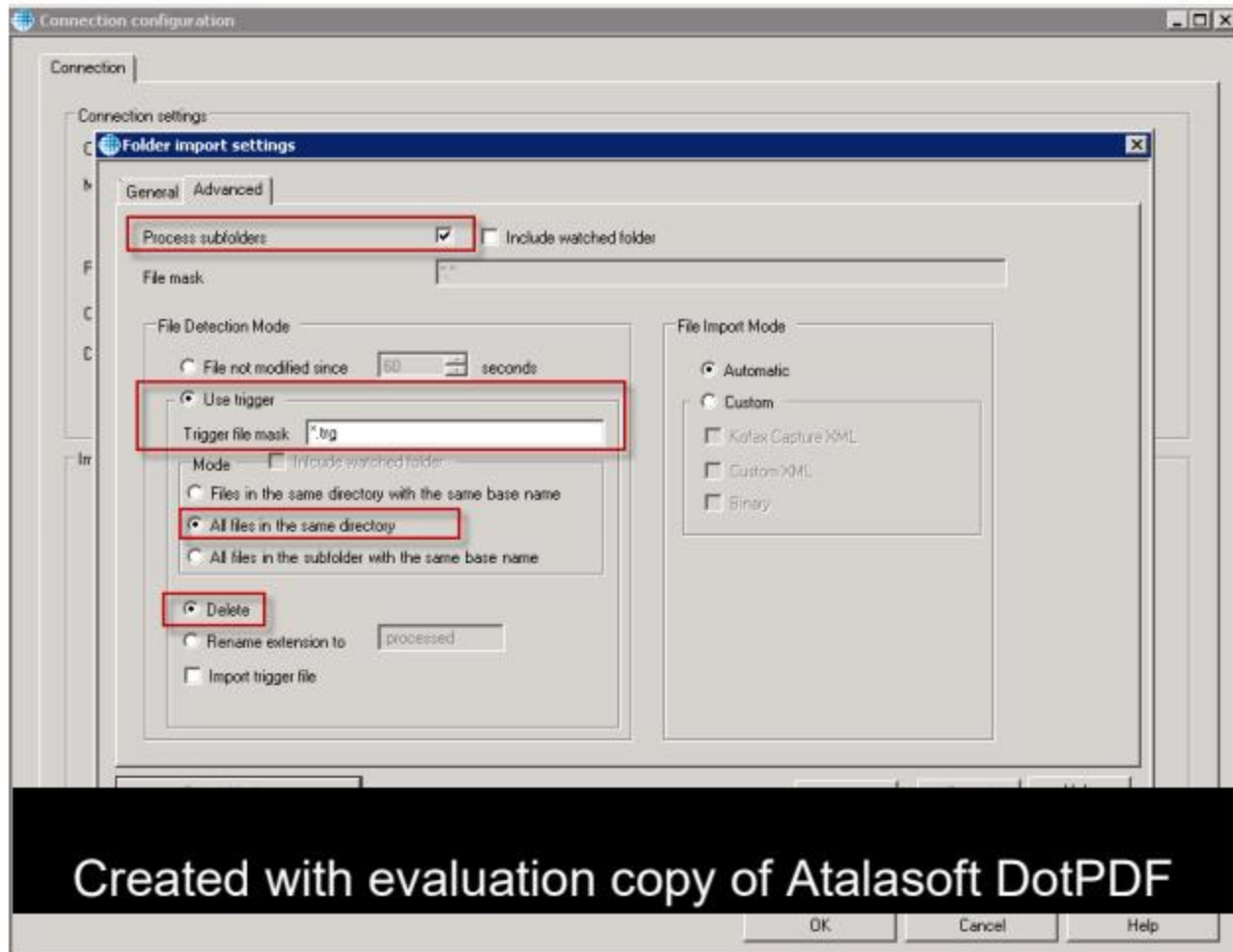
Test the folder import again to make sure that the connection has not been broken

Accept the changes ("OK") and close.

Back on the KC plugin configuration dialogue on p.14, on the Assistance Tasks select "Kofax Capture Settings"

Make sure that the number of KIC process instances equals to 1 (This number can be increased to make the ingestion of documents faster):
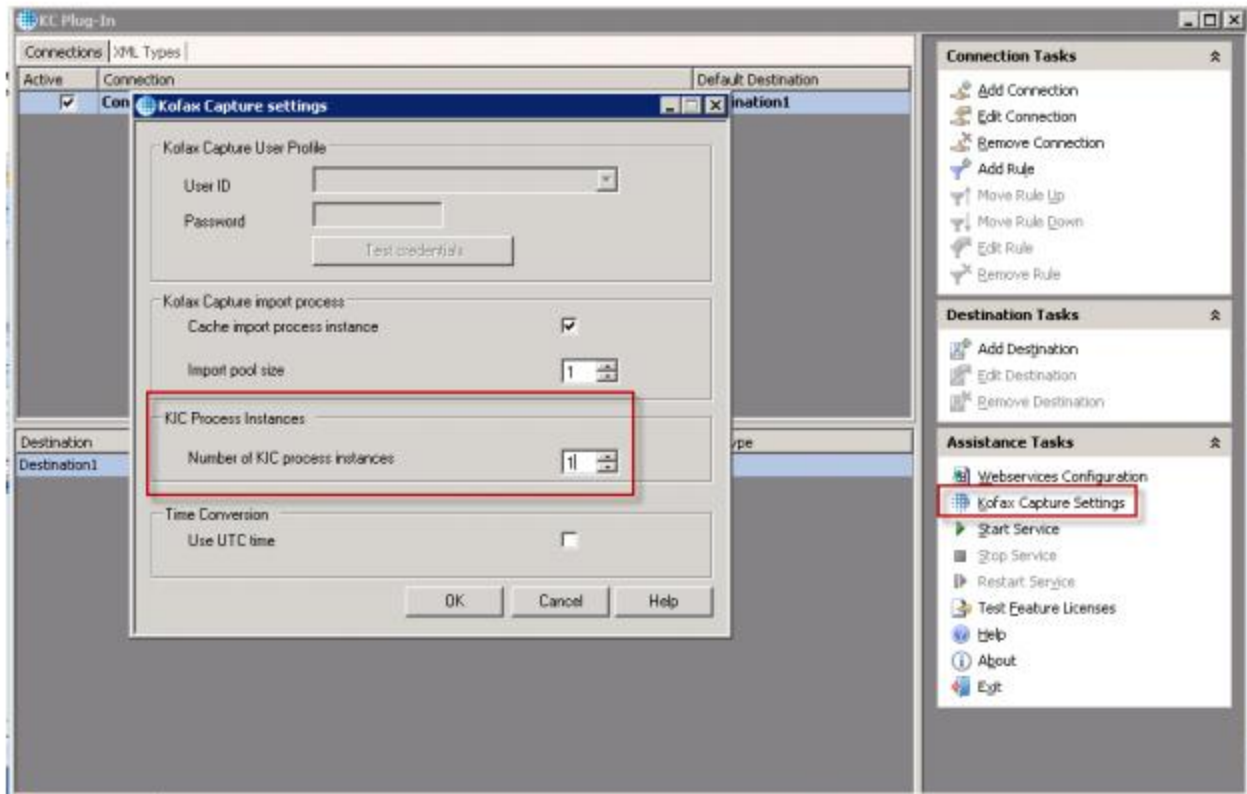
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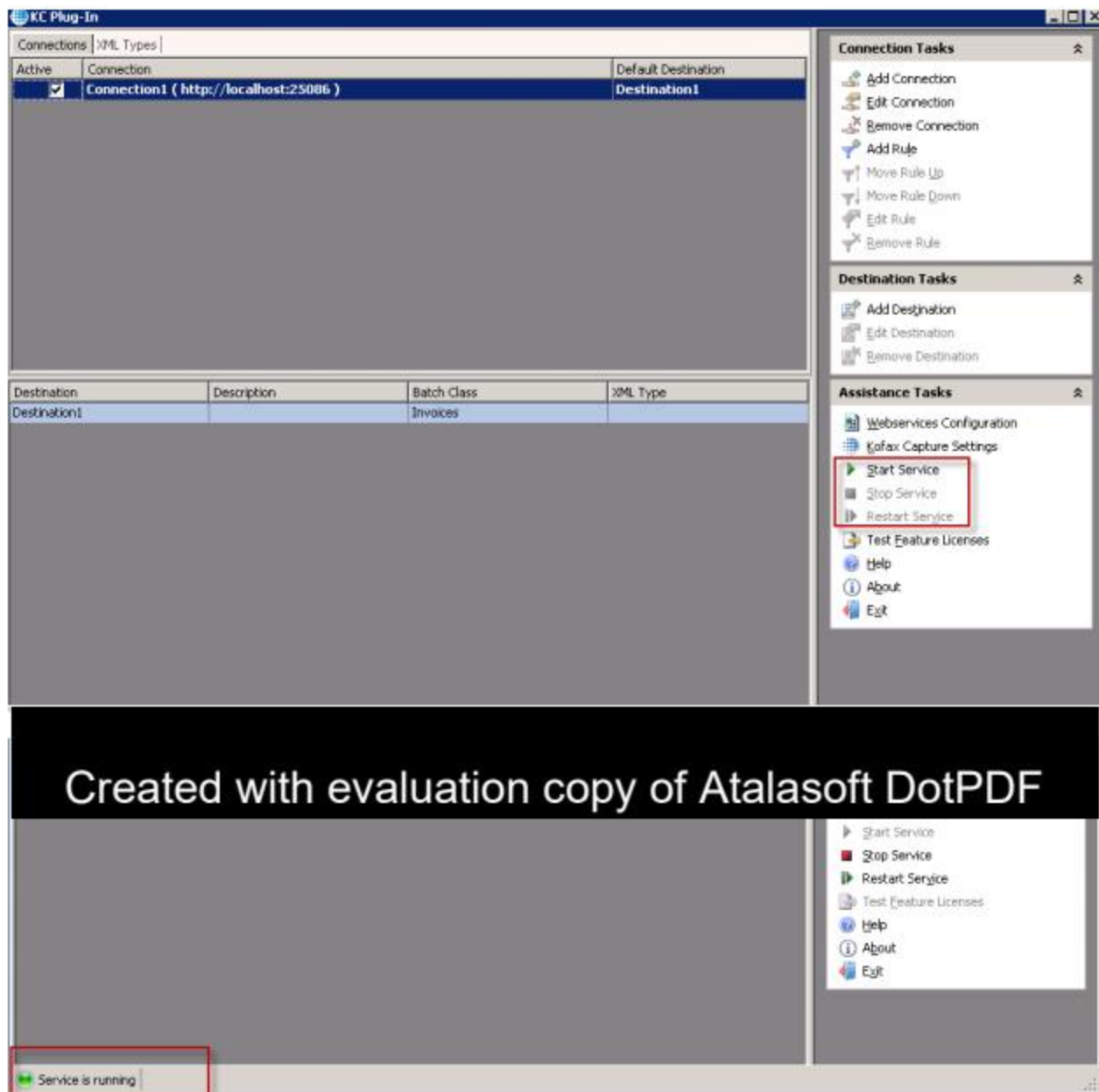
3.3   Message Connector

Refer to the MC user guide for additional information. Open the Message connector configuration:
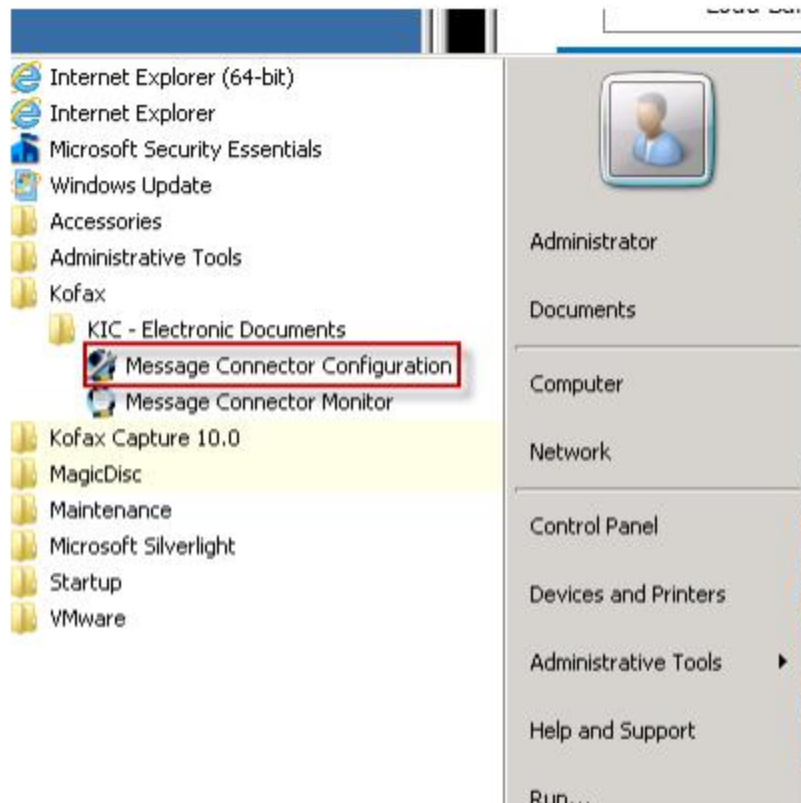
In the general tab change the following

Storage Size : 1000

Prefetch Messages : 40

Once the changes have been completed save the changes, exit and restart the service
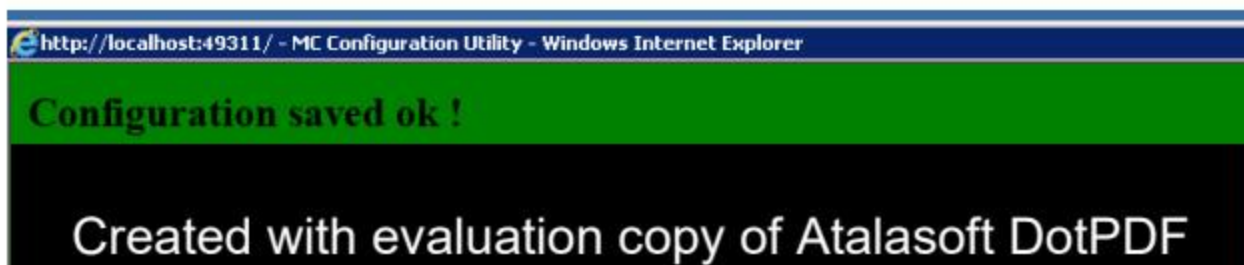
4. Testing Scenarios

4.1 Characterization Scenario

The purpose of the characterization scenario is to determine the behavior of export connector while exporting documents to a content manager repository. Performance characterization is achieved by measuring the throughput (Pages/min) and resource utilization (CPU, memory, etc.) that a single export instance is capable of sustaining with a fixed workload.

Please use the batch class, test images, and test scripts located below to execute this test: \\sqafs\AscentSQAProjects\Performance\Kofax_Export_Connectors

4.1.1 Test Execution

In order to perform a characterization test, execute the following steps:

1. Stop all KC services with the corresponding "*stop_(Kofax/Export/Test)Services.bat*"
2. Start Kofax Services with "*start_KofaxServices.bat*" script
3. Load a workload of 2500 pages (100 batches with 25 pages each) to the watched folder. Use the "Watch Folder Filler utility"
4. Start Scan Services with "*start_Test.bat"* script
5. Wait until the workload is processed by the KC modules started with the Kofax Services scripts. Notice that batches are queued at the Export module.
6. Once all of the batches ingested are loaded in the export queue, start the Performance Counter collector with "*perfmon_start.bat*"
7. Once the collector is started, start the export services with "*start_ExportServices.bat*"
8. Wait until the last batch has been completed. Then stop the performance counter collector with "*perfmon_stop.bat".* A new file of the form **perfmon-<CollectorName><date>.<time>.blg** will be created (for example perfmon-CMIS20130417.164230.blg)
9. Filter the counter log file using *"perfmon_filter_NoStartEnd.bat".* You are going to get a new file of the form **relog_cpu.<date>.<time>.csv** (for example relog_cpu.20130418.104129.csv)
10. Copy the KC logs for the run from the CaptureSV folder using *"CopyKCLogs.bat"*. You are going to get a new folder called "runlogs" with the KC logs inside.
11. Copy the .blg file, .csv file and runlogs folder to a new folder that identifies the run that was executed. (For example you can create a folder called CMIS_Characterization_Test1).

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given in terms of batches/min. You need to convert this throughput to pages/min in order to perform the analysis (multiply the result by 25 since each batch has 25 pages).
14. Open the relog_cpu.<date>.<time>.csv file and find the following counters for the export station:
    -   Processor(_Total)\% Processor Time
    -   Memory\Available Mbytes
    -   LogicalDisk (C:)\%Idle Time
    -   LogicalDisk(C:)\Avg. Disk Queue Length
    -   Processor(Release)\% Processor Time
    -   Process(Release)\Handle Count
    -   Process(Release)\Private Bytes
    -   Process(Release)\ThreadCount
    -   Network Interface\Bytes Total/sec

    These counters provide a general overview of the system resource utilization.

15. Repeat steps 1 to 14 at least 2 more times. Make sure that you save the results as they will be used in the Characterization Test Result Analysis section.
16. Average the throughput results obtained in the three test runs. The average will be your characterization scenario throughput.

17. Average the performance counter results obtained in the test execution section. The average will be your characterization scenario performance counters resource utilization.
18. Additional statistics can be calculated (standard deviation, variance, etc.). See the Statistical Significance of Measurements section.

4.1.2 Characterization Test Result Analysis

Comparing the throughput and the performance counters that we obtained in the test execution section should be a starting point for characterization analysis. In general we are expecting the following:

- A consistent throughput of pages per minute from the start of the test to the end of the test. (Ramp up/ramp down time is acceptable, but should be easily identifiable).
- Low throughput variance between test run results (within 5-7%)
- A consistent CPU utilization throughout the length of the test. (Generally a flat graph, some spikes are acceptable but they should explainable). Usually described by Processor (_Total)\% Processor Time, and Processor (_Total)\% Processor Time counters.
- A consistent Memory utilization over the length of the run (generally flat graph). Usually described by the Memory\Available Mbytes and Process (Release)\Private Bytes counters.
- An explainable Disk I/O utilization (For example, if the system is writing to the local drive, then we would expect to see a lot of activity. However, if batches are temporarily stored to

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Network Interface\Bytes Total/sec counters.

Throughput and resource utilization can be compared against metrics from a previous export connector release. However, the performance behavior may vary between applications, and the above mentioned counters may not suffice for determining the root cause of a performance issue. The links below provide additional information regarding performance counters:

- http://www.enduria.eu/key-performance-counters-and-their-thresholds-for-windows-server-recommended-by-microsoft/
- http://technet.microsoft.com/en-us/library/bb734903.aspx
- http://technet.microsoft.com/en-us/library/cc768048.aspx

4.2   Scalability Scenario

The purpose of the scalability scenario is to determine the behavior of an export connector while export connector instances are increasingly added to export content. Exporting throughput and resource utilization should be able to scale in a linear fashion as we increase the number of export instances.

Please use the batch class, test images, and test scripts located below to execute this test: \\sqafs\AscentSQAProjects\Performance\Kofax_Export_Connectors

4.2.1 Test Execution

In order to perform the scalability tests, we execute the following steps:

1. Stop all KC services with the corresponding "*stop_(Kofax/Export/Test)Services.bat*"
2. Start Kofax Services with "*start_KofaxServices.bat*" script
3. Load a workload of 2500 pages (100 batches with 25 pages each) to the watched folder. Use the "Watch Folder Filler utility"
4. Start Scan Services with "*start_Test.bat"* script
5. Wait until the workload is processed by the KC modules started with the Kofax Services scripts. Notice that batches are queued at the Export module.
6. Once all of the batches ingested are loaded in the export queue, start the Performance Counter

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with "*perfmon_stop.bat".* A new file of the form **perfmon-<CollectorName><date>.<time>.blg** will be created (for example perfmon-CMIS20130417.164230.blg)
9. Filter the counter log file using *"perfmon_filter_NoStartEnd.bat".* You are going to get a new file of the form **relog_cpu.<date>.<time>.csv** (for example relog_cpu.20130418.104129.csv)
10. Copy the KC logs for the run from the CaptureSV folder using *"CopyKCLogs.bat"*. You are going to get a new folder called "runlogs" with the KC logs inside.
11. Copy the .blg file, .csv file and runlogs folder to a new folder that identifies the run that was executed. (For example you can create a folder called CMIS_Scalability_OneExportInstance_Test1).
12. Delete the KC Logs; use the *"deleteKCLogs.bat"* script.
13. Parse the KC log file obtained with the" *sqaperfrpt.pl*" script. Record the end to end system throughput and Export Module throughput in a spreadsheet. Notice that this throughput is given in terms of batches/min. You need to convert this throughput to pages/min in order to perform the analysis (multiply the result by 25 since each batch has 25 pages).
14. Open the relog_cpu.<date>.<time>.csv file and find the following counters for the export station:
    -   Processor(_Total)\% Processor Time
    -   Memory\Available Mbytes
    -   LogicalDisk (C:)\%Idle Time

- LogicalDisk(C:)\Avg. Disk Queue Length
- Processor(Release)\% Processor Time
- Process(Release)\Handle Count
- Process(Release)\Private Bytes
- Process(Release)\ThreadCount
- Network Interface\Bytes Total/sec

These counters would provide a general overview of the system resource utilization.

15. Repeat steps 1 to 14 at least 2 more times (3 total). Make sure that you save the results as they will be used in the Characterization Test Result Analysis section.
16. Modify the *"start_ExportServices.bat"* to start {2, 4, 6, 8, 10, 14, and 16} export instances. Then repeat steps 1 to 16. You need to collect three test runs for each {1, 2, 4, 6, 8, 10, 14, and 16} export instances. A total of 24 Test runs will be needed. See table below for an example.

| Throughput | # Export Instances | | | | | | | | |
Test Run #	1	2	4	6	8	10	12	14	16
1	25.20	49.56	72.33	96.52	136.88	169.55	200.12	225.21	244.22
2	25.40	49.12	73.01	96.45	136.45	168.21	199.56	226.44	244.97
3	25.01	49.02	72.45	96.32	135.99	169.88	201.22	22.00	244.55
Av									244.58

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Processor(_Total)\% Processor Time									
	# Export Instances								
Test Run #	1	2	4	6	8	10	12	14	16
1	7.76	15.26	22.28	29.73	42.16	52.22	61.64	69.36	75.22
2	7.82	15.13	22.49	29.71	42.03	51.81	61.46	69.74	75.45
3	7.70	15.10	22.31	29.67	41.88	52.32	61.98	6.78	75.32
Average	7.76	15.16	22.36	29.70	42.02	52.12	61.69	48.63	75.33

17. Once you have the 24 test run results for both the throughput and performance counters, calculate the average of the runs. This will be the scalability throughput and resource utilization for each combination of export instances.
18. Additional statistics can be calculated (standard deviation, variance, etc). See the Statistical Significance of Measurements section.

4.2.2 Scalability Test Result Analysis

Similar to the characterization scenario, comparing the throughput and the performance counters that we obtained in the test execution section should be a starting point for scalability analysis. In general we are expecting the following:

- A consistent throughput of pages per minute from the start to the end of the test for each combination of export instances (Ramp up/ramp down time is acceptable, but should be easily identifiable).
- Throughput should be at least 1.6-1.7 times higher when the number of export connector instances is doubled. (It is acceptable for the throughput increment to be lower when a large number of export connector instances is utilized, >12-14 export instances).
- Low throughput variance between test run results for each combination of export instances (within 5-7%)
- A consistent CPU utilization throughout the length of the test for each combination of export instances. (Generally a flat graph, some spikes are acceptable but they should explainable). Usually described by Processor (_Total)\% Processor Time, and Processor (_Total)\% Processor Time counters.
- CPU utilization should be at least 1.6-1.7 times higher when the number of export instances is doubled.
- A consistent Memory utilization over the length of the run for each combination of export

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Memory utilization should be directly proportional to the number of export instances (Memory utilization should increase if the number of export connector instances increases).
- An explainable Disk I/O utilization (For example, if the system is writing to the local drive, then we would expect to see a lot of activity. However, if batches are temporarily stored to a shared drive, we should not see too much Disk I/O activity). Generally given by LogicalDisk (C:)\%Idle Time and LogicalDisk (C:)\Avg. Disk Queue Length.
- A network bandwidth capable of transferring the batches exported. Generally described by Network Interface\Bytes Total/sec counters.

Throughput and resource utilization can be compared against a previous export connector release metrics, to determine a performance improvement in the export connector, etc. However, the performance behavior may vary between applications, and the above mentioned counters may not suffice to determine the root cause of a performance issue.

4.3 Longevity Scenario

The purpose of the longevity testing scenario is to determine the behavior of the export connector while continuously exporting documents to a backend repository for an extended period of time. Six export instances are utilized in this scenario to export documents for a period of 72 hours. This test

scenario is usually run unattended and during the weekend. Throughput and performance counters will be collected since the ingestion of the first document by a scan module until the last batch is exported by the export connector.

Please use the batch class, test images, and test scripts to execute this test: \\sqafs\AscentSQAProjects\Performance\Kofax_Export_Connectors

4.3.1 Test Execution

In order to perform the longevity tests, we need to modify the *"start_ExportServices.bat"* script to start 6 export service instances. Then execute the following steps:

1. Stop all KC services with the corresponding "*stop_(Kofax/Export/Test)Services.bat*"
2. Start Kofax Services with "*start_KofaxServices.bat*" script
3. Start the Export Services with the *"start_ExportServices.bat"* script
4. Configure the "*Watch folder filler utility"* to continuously load 100 batches to the watched folder. (Click on Start but do not click on stop).
5. Once the first set of 100 documents is loaded in the watched folder start the Performance Counter collector with "*perfmon_start.bat*"
6. Start Scan Services with "*start_Test.bat*" script

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   with *perfmon_stop.bat*. A new file of the form *perfmon-<collectionName>-<date>.<time>.blg* will be created (for example perfmon-CMIS20130417.164230.blg)
9. Filter the counter log file using *"perfmon_filter_NoStartEnd.bat".* You are going to get a new file of the form ***relog_cpu.<date>.<time>.csv*** (for example relog_cpu.20130418.104129.csv)
10. Copy the KC logs for the run from the CaptureSV folder using *"CopyKCLogs.bat"*. You are going to get a new folder called "runlogs" with the KC logs inside.
11. Copy the .blg file, .csv file and runlogs folder to a new folder that identifies the run that was executed. (For example you can create a folder called CMIS_Characterization_Test1).
12. Delete the KC Logs; use the *"deleteKCLogs.bat"* script.
13. Parse the KC log file obtained with the" *sqaperfrpt.pl*" script. Record the end to end system throughput and Export Module throughput in a spreadsheet. Notice that this throughput is given in terms of batches/min. You need to convert this throughput to pages/min in order to perform the analysis (multiply the result by 25 since each batch has 25 pages).
14. Open the relog_cpu.<date>.<time>.csv file and find the following counters for the export station:
    - Processor(_Total)\% Processor Time
    - Memory\Available Mbytes
    - LogicalDisk (C:)\%Idle Time
    - LogicalDisk(C:)\Avg. Disk Queue Length

- Processor(Release)\% Processor Time
- Process(Release)\Handle Count
- Process(Release)\Private Bytes
- Process(Release)\ThreadCount
- Network Interface\Bytes Total/sec

These counters would provide a general overview of the system resource utilization.

15. Average the performance counter results obtained in the test execution section. The average will be your longevity scenario performance counters resource utilization.
16. Calculate the throughput obtained for the entire 72 hour period.
17. Calculate the throughput obtained per hour by the system. Collect the results in a spreadsheet for later analysis.
18. Download and install the free PAL log file analysis tool from Codeplex (http://pal.codeplex.com/) and use that tool to analyze the logs.

4.3.2 Longevity Test Result Analysis

Comparing the throughput and the performance counters that we obtained in the test execution section should be a starting point for longevity analysis. In general we are expecting the following:

- A generally consistent exporting throughput with no significant degradation over the entire

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- A consistent CPU utilization over the length of the run on the export station. No significant degradation should be observed.
- A consistent CPU utilization for each one of the export instances utilized to export documents.
- A consistent Memory utilization over the length of the run. This test often reveals memory leaks. (Note that KC currently has a known memory leak of about 3.7 MB/hr.)
- A consistent Disk I/O utilization over the length of the run.

Throughput and resource utilization can be compared against a previous export connector release metrics, to determine a performance improvement in the export connector, etc. However, the performance behavior may vary between applications, and the above mentioned counters may not suffice to determine the root cause of a performance issue. The links below provide additional information regarding memory leaks:

- http://www.codeproject.com/Articles/42721/Best-Practices-No-5-Detecting-NET-application-memo
- http://bshwjt.blogspot.com/2010/08/how-to-find-memory-leak-using.html
- http://support.microsoft.com/kb/130926
- http://msdn.microsoft.com/en-us/library/windows/hardware/ff541886(v=vs.85).aspx

5. Statistical Significance of Measurements

In order to ensure and preserve the accuracy of the Kofax Capture performance measurements, we verified that our measurements were statistically significant. Each data point in this document represents the average of at least three runs. Variance and standard deviation are calculated for each set of measurements.

As an illustration of our verification process, consider the following data:

		Scan	Recognition	PDF Generator	Export
Run 1	**Batches Processed**	500	500	500	500
	Elapsed time	00:27:15	00:28:46	00:28:03	00:27:53
	Pages/min	458.75	434.75	445.75	448.5
Run 2	**Elapsed time**	00:27:11	00:27:42	00:27:37	00:28:01
Run 3	**Elapsed time**	00:27:56	00:27:46	00:27:13	00:27:10
	Pages/min	447.5	450.25	459.25	460
Average	**Pages/min**	455.33	445.42	452.58	451.50
Variance		30.85	57.06	30.39	37.17
Standard Deviation		5.55	7.55	5.51	6.10

The standard deviation values show that the data are clustered very close to the average value, hence asserting the accuracy of the data.

6. Hardware and VM Configuration

6.1   Hardware Configuration

The following hardware is currently being used to execute the performance tests:

- HP ProLiant DL580 G7 Server (quantity: 2)

  4 CPUs: 4-Core Intel® Xeon® Processors E7520 (1.87GHz, 18MB Cache, 95W)

  32GB RAM: HP 8GB PC3-10600R 2x4GB 2 Rank Memory X 4

  72GB HD: HP 72GB 6G Hot Plug 2.5 SAS Dual Port 15,000 rpm Hard Drive X 2 (Mirrored)

- Small SAN with no Redundant controller and 600GB @ RAID 5, small Fiber Channel Switch, GB Network Switch
- HP StorageWorks P2000 G3 MSA Fiber Channel Controller
- HP 146GB 6G Hot Plug 2.5 SAS Dual Port 15,000 rpm Hard Drive

6.2   VM Configuration

The following 6 VM's are hosted in the HP Servers described in the Hardware Configuration:

- KCCM-Driver (Test driver)

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- KCCM-Recog (KC Recognition Server 1)
- KCCM-Recog2 (KC Recognition Server 2)
- KCCM-Export (KC Export Server)

All of the VM's share the same configuration:

- 4 virtual cores (1.87 Ghz. Each)
- 4 GB of RAM
- 30 GB Hard drive
- Windows Server 2008 R2
- Windows SQL Server 2008 R2 (KCCM-DB and SQA2K8R2 only).

The following credentials should be used for accessing each VM:

- Windows authentication : Administrator/K00fax
- SQL Authentication: sa/K00fax