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NiceLabel

NiceWatch Enterprise Performance

Can you afford to work without it?

White Paper

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1 Executive Summary

The labeling software market, although not as saturated as some others, is full of products with ambiguous names, so-called professional and corporate editions, product packages, and special offers. Cutting through the marketing veils and understanding what it is that they actually offer forces the client to compare technical specification tables and function lists, both an arduous and confusing task. These products are meant to be put into practical use, and the information that the client truly needs is a comparison of practical applications of the products he's considering.

This white paper focuses on NiceWatch, a cutting-edge middleware labeling integration module. As there are two drastically different versions of NiceWatch available, the white paper will present a set of practical test cases which most accurately illustrate the differences in intended uses and performance of NiceWatch and NiceWatch Enterprise.

The paper will look into the nominal differences in the technical features of the two applications; it will also present the results of capacity stress tests and compare them, then provide suggestions on the most appropriate practical purposes of both applications based on those tests.

The assumption before the beginning of the tests was that NiceWatch Enterprise, by employing multiple print engines to handle workloads on multiple printers, performs significantly faster than it's counterpart in complex printing scenarios.

While it does not take an industrial test to observe the clear difference in the speeds of both products, the tests were performed in order to accurately quantify this difference in numerical values, based on controlled environment measurements.

2 Overview

2.1 Integration Middleware

NiceWatch and NiceWatch Enterprise both function primarily as middleware, facilitating the integration of NiceLabel solutions into existing IT infrastructures. They stand between data systems and applications and the printing infrastructure, ensuring complete compatibility and seamless integration of NiceLabel printing functionalities into existing systems, and act as an alternative to programming and export-based labeling system integration methods.

Both middleware modules are focused on providing unparalleled flexibility and performance, aiming to provide the users with a solution that demands the smallest possible extent of alteration of existing systems, while retaining or even improving the data throughput capacity and printing speeds of the system as a whole.

2.2 NiceWatch

At times, automated printing is required in a multi-operating system environment (Unix, AS/400, Host, etc.) or complex application environments (ERP, WMS, etc.), where it is not possible to write program code using Automation commands. Deploying NiceWatch, a powerful middleware module on a Windows platform, provides an affordable solution in these situations.

Main Characteristics

- Enables printing from other local or remote applications running within the network
- Triggers label printing with simple file drop on a shared disk (including data or commands)
- Connects with COM port devices (scale, barcode reader) using monitoring or polling
- Internet printing (e-mail, TCP/IP sockets)
- Data filtering (use existing reports, printer command files, XML files, etc.)
- Optional VB Scripting for advanced programming customization
- Can run as a service (no user login required) on all supported Windows versions

2.3 NiceWatch Enterprise

NiceWatch Enterprise is capable of printing labels on multiple printers from your WMS, ERP, HIS or similar systems at maximum possible speeds. NiceWatch Enterprise provides you with a:

- Multi-threaded printing technology that ensures fast and faultless operation even in the most demanding environments.
- Scalable enterprise-level integration middleware that does not require any programming or coding change of your existing information systems.
- A server-based solution that enables applications and systems to initiate label printing from a centralized location.

All printers in your organization can be managed from one location through the web-based Enterprise Print Manager module which is also part of your NiceWatch Enterprise environment. It includes real time printer status monitoring, combined with a multi-channel alerting system, and minimizes the risk of continuous production line standstills and ensures that you immediately learn about label printing errors, warnings, or simple confirmations of executed print jobs.

Enterprise Series Features	Description
Multi-threading	Multiple print engines and printing threads are available to the program, drastically improving printing performance in complex automated printing scenarios
EPM - storage server - web printing - centralized remote supervision - printer status report	Enterprise Print Manager is a web-based enterprise module for server-based printing, centralized document, printer, and event management - Centralized common label file repository - Wizard-based centralized web printing interface - Centralized supervision of printing jobs and workstation activities - Centralized supervision of printer statuses and errors
NiceWatch Server	Enterprise solution for centralized integration of label printing
Server licensing	Centralized management of all NiceLabel licenses across the organization
Multi-channel alert system	Status changes or problems with print jobs are immediately reported with alerts by e-mail, NetSend, RSS, SMS
Web service trigger	Web service trigger, triggering a customizable set of actions upon receipt of a web service broadcast
Web service action	Web service action, sending a web service broadcast when called upon by a trigger
HL7 filter and outbound action	HL7 (Health Level Seven) standard compliant filter and outbound message action

2.4 Test Objectives

The objective of the stress tests is to evaluate the levels of NiceWatch Enterprise performance and how these differ from NiceWatch. The tests will show the differences in performance of both applications in a range of scenarios of scaling demands.

Two levels of performance will be evaluated, raw printing capacity, as well as the responsiveness to new print jobs under working conditions. Optimally, the goal of a performance system is to provide a high throughput capacity and immediate production of labels when needed regardless of concurrent system workloads.

3 Comparative Performance Tests

The performance tests were done to assess the differences between the performance of NiceWatch and NiceWatch Enterprise across a scale of printing scenarios. The tests covered scenarios ranging from simple workloads with few simultaneous data processes to complex scenarios with broad ranges of data collection and label complexity. The purpose of the performance tests was to illustrate the impact of multi-threading on complex printing environments, and the results were expected to show that several printing engines significantly impact the printing speed in such environments.

3.1 Test Configuration

Printers used in the performance tests, in no particular order:

- Avery AP 5.3
- Cognitive Cxi
- Intermec Easy Coder PF4i
- Imaje MP Compact 4
- Intermec Easy Coder F2
- Sato GT 424e

Labels:

Two different labels were used in the performance tests. The first (simple label) is a basic label with one string of text. The second (complex label) is an advanced label with several variables (counter, date field...), a function, a barcode, and an image. Both labels were prepared for all printers.

3.2 Individual Performance Tests

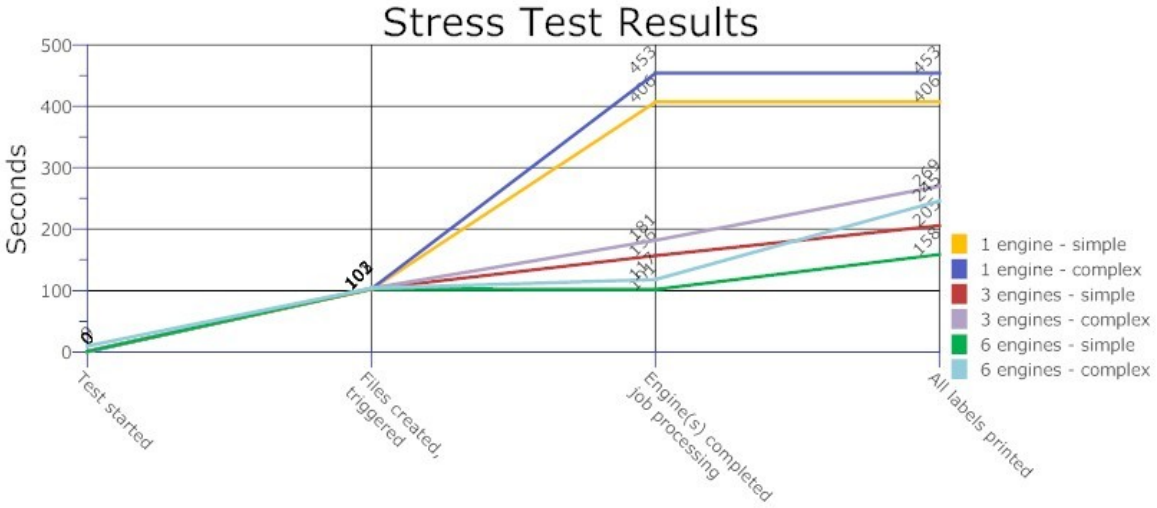
The testing process included three groups of tests:

- NiceWatch test 1 print engine
- NiceWatch Enterprise test 3 print engines
- NiceWatch Enterprise test 6 print engines

Each test consists of 2 parts, one with a simple and one with a complex label.

All other test factors remain equal, and the test results indicate the differences between various numbers of print threads and their effect in both simple-label and complex-label scenarios. The triggers used in the tests surveyed a folder for new files, read the name of the label from a new file, and all triggers included the actions Open Label and Print Label.

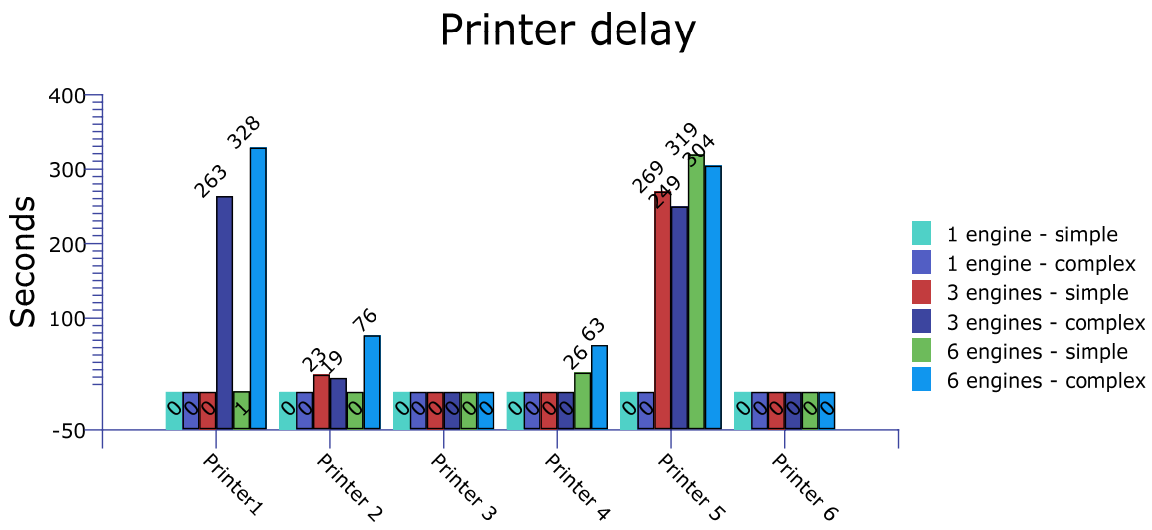
The activity that was replicated was a system being charged with printing 100 labels to each of 6 printers. The printing time was measured for individual (different) printers. Immediate observation revealed that the use of a single print thread (engine) resulted in a sequential printing of labels across the printer group.



Low values on the graph are better, as they indicate that the complete printing process was finished in a shorter time.

It's important to note that the »All labels printed« category includes the average printing time of all 6 printers. As the tests have shown, some printers introduced their own delays to the process. Optimally, a high-quality printer would not introduce any delay, and the charts would be horizontal in the final stage.

Of the tested printers, two have performed poorly and caused significant delays after the data processing and transfer phases.



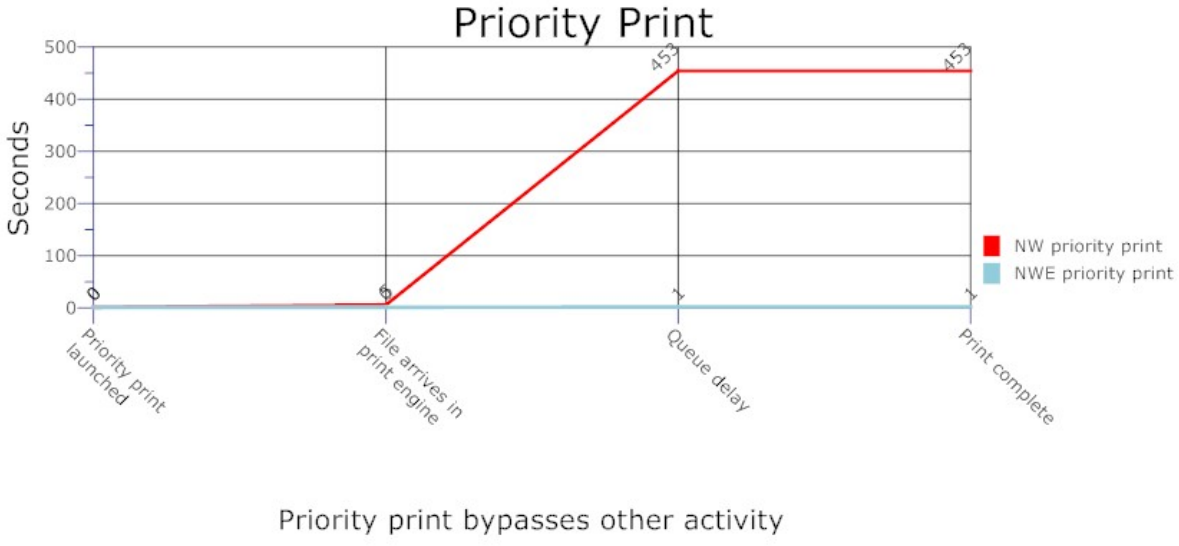
The key process difference between the 2 applications: **NiceWatch, much like all applications without multithreading, processes and prints one label at a time. NiceWatch Enterprise, when several engines are used, prints to all printers simultaneously.**

3.3 High Priority Print Test

The second test type was intended to measure the performance of high priority printing. NiceWatch Enterprise, through the use of its multithreading technology, enables the user to »reserve« a print thread for a high priority trigger.

NiceWatch, like any other system without multithreading, has no technical capability to prioritize a specific printing task or assign a level of urgency to it.

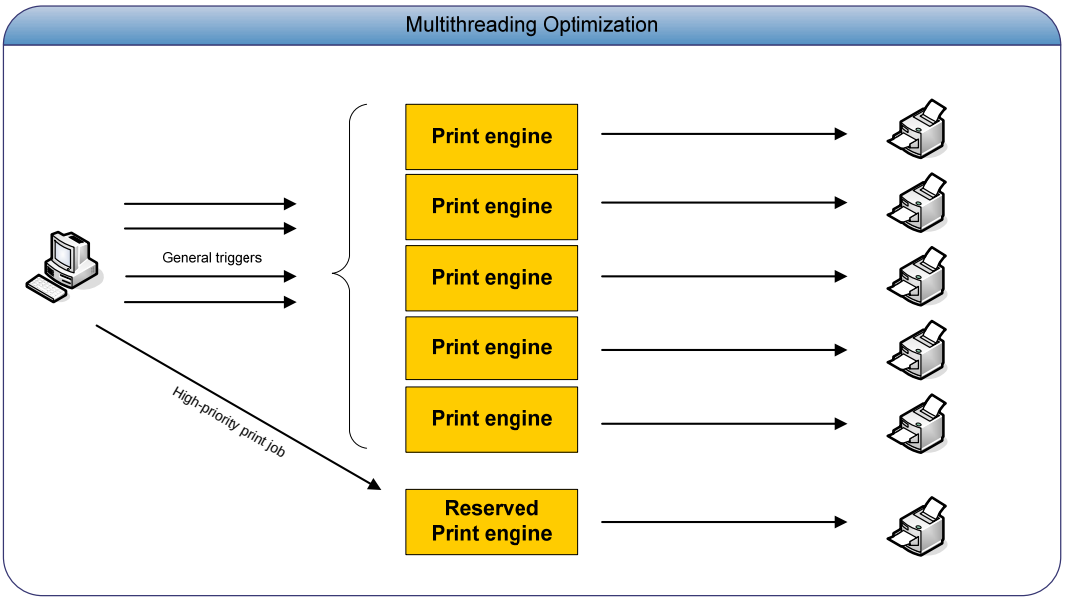
In practice, this means that it can provide a label printing job that is more urgent than the mundane constant automated print jobs a reserved print thread which immediately processes the job regardless of the queues in other print threads.



This test assumes that a priority print of a complex label is launched immediately after the complex stress test on the previous page begins.

When a priority print is launched in NiceWatch, it enters the queue to enter the print engine, and is processed and printed once its turn is up.

NiceWatch Enterprise bypasses all other activity, a “local trigger” immediately triggers and sends the data to a “local print thread”. This idle print engine does not have any queues and the priority print is processed immediately.



Test 51 (6 threads)

Six file triggers and six print threads were used. File triggers were monitoring one folder each. 600 files were generated in 1 minute and 40 seconds in the folders.

Each trigger triggered 100 times and created print jobs in the internal print list, which filled up to 337 entries due to the complexity of the entries. The jobs entered the spooler (for all printers) in **3 min 40 s**. Only one printer managed to print as fast as the jobs were entering the spooler.

Summary: A file trigger with a simple label was printing as long as other triggers.

Test 51 (5 + 1 threads)

The same settings were used as in the previous test. Six file triggers were used, five global print threads and one local print thread. Six file triggers were monitoring one older each. 600 files were generated in the folders in 1 minute and 40 seconds.

Each trigger triggered 100 times and created print jobs in the internal print list, which filled up to 292 entries. The jobs entered the spooler (for all printers) in **3 min 40 s**. The printers were unable to print as fast as the jobs were entering the spooler, and the local print list filled up to 31 entries.

The priority job was printed in **2 min 14 s**, and the printer itself caused no printing delay. Effectively, the priority job was printed as fast as the technical infrastructure allowed, with no structural delay whatsoever.

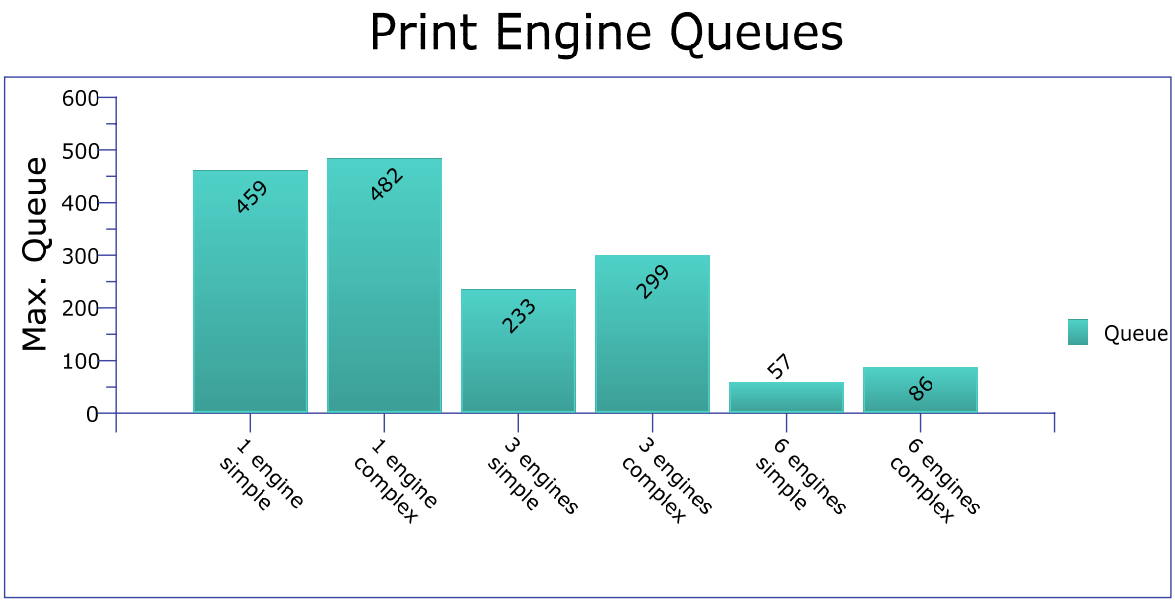
Summary: The file trigger with the simple label was printing independently of the other triggers, and therefore completed label printing as fast as if no other operation was being performed on in the broader printing infrastructure.

3.4 Test Data Summary

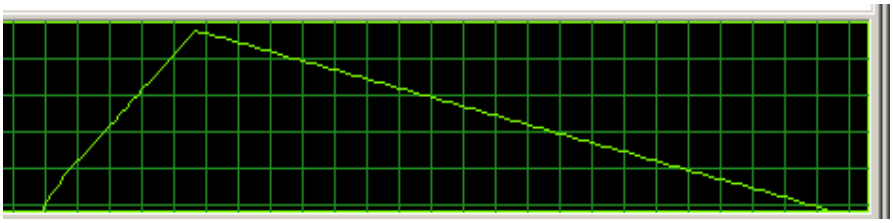
The tests confirm the assumption that a multithreading system drastically improves both raw output capacity and responsiveness when printing an urgent job on a running system.

The raw performance improvement comes from providing additional engines to the infrastructure. An engine can only process a single label at a time, therefore the raw output performance of a system with a dozen printers and one engine is exactly the same as that of a system with one printer and one engine.

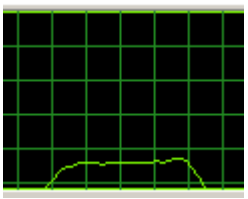
Pending prints queue before the engine and await processing, and additional engines are the most significant way to keep the queues under control.



The 2 images below are screen captures of queues over time in test with 1 and 6 threads.



NiceWatch - 1 engine



NiceWatch Enterprise – 6 engines

As was expected, NiceWatch Enterprise excelled at handling distributed workloads in the model. It performed up to 380% faster than NiceWatch when using 6 print threads, and has achieved much better scores overall on all of the tests that were performed. Additionally, NiceWatch Enterprise offered the possibility of “immediately” printing a priority job regardless of the system’s workloads, which is only possible due to the multithreaded approach.

3.5 Optimizing settings to suit your environment

The optimization of settings (or lack thereof) can significantly affect the performance of NiceWatch and NiceWatch Enterprise. For example, increased workloads which can at a point cause bottlenecks in a trigger, printing engine or printer can easily be handled by dispersing the workload across multiple triggers, printing engines or printers. The system itself does offer blistering performance, but this is only attainable if the system is set up optimally. There are dozens of custom settings that enable unparalleled levels of customization, but this inherently means that improper settings of the system can and do have a negative effect on the overall performance of the system.

3.6 External Factors Influencing Performance

Several external factors affect printing performance in practice. These include (but are not limited to) system specifications, printer type, and general data transfer infrastructure capacity.

It is plainly obvious that an infrastructure with responsive enterprise-level printers is much more flexible, performing at speeds which are not achievable by solutions without multithreading technology. However, such performance demands not only an enterprise-level printing solution, but also enterprise-level printer hardware.

As the tests have shown, printers represent a significant performance variable. The speeds at which printers were printing labels varied extremely, in some cases exceeding the “expected” printing time by over 300%. This means that the choice of printers for enterprise-level printing jobs is as important a factor as any, and where printing speed is an important production factor, identifying and removing all potential bottlenecks is the only way to achieve optimal results.

4 Conclusion

The test cases make it plainly obvious that, assuming that the printers themselves are up to the task, a multithreaded approach is an absolute necessity in any distributed printing environment. In any environment where labeling is a part of the production process, especially an automated one, label printing delays often cause a ripple effect down the production line.

Automated and/or integrated label printing is not a lynchpin process in a production chain, and cannot dictate the pace of production. When called upon, it has to be ready to instantly deliver the printed labels, minimizing the impact of circumstances and current workloads.

Multithreading and its distributed printing speed, reserved threads for high-priority print jobs, and of course, a successfully integrated label printing process, are made for the task. No other current infrastructural method even remotely replicates this performance.

Appendix

Test Sheets

NW (simple label)

Triggers used	1	
Label Type	Simple	
Print threads	1	
File generation	600 files in 1m 40s	100 labels to each printer
File trigger performance	600 triggers without delay	
Trigger type	File trigger	
Maximum print job queue	459 jobs	
Job entry to spooler	6m 47s	
Printer performance	All printers printed continuously	
Summary	600 labels / 6m 47s	

NW (complex label)

Triggers used	1	
Label Type	Complex	
Print threads	1	
Trigger type	File trigger	
File generation	600 files in 1m 40s	100 labels to each printer
File trigger performance	600 triggers without delay	
Maximum print job queue	482 jobs	(due to complex label)
Job entry to spooler	7m 35s	
Printer performance	All printers printed continuously	
Summary	600 labels / 7m 35s	

NWE3 (simple label)

Triggers used	3	(each trigger monitoring one folder)
Label Type	Simple	
Print threads	3	
Trigger type	File trigger	
File generation	600 files in 1m 40s	100 labels to each printer

File trigger performance	600 triggers without delay	(200 per trigger)
Maximum print job queue	233 jobs	
Job entry to spooler	2m 37s	
Printer performance	2 printers printed labels slower than they were processed	
Summary	600 labels / 2m 37s	2 printers could not print as fast as the jobs were processed, causing a delay

NWE3 (complex label)

Triggers used	3	(each trigger monitoring one folder)
Label Type	Complex	
Print threads	3	
Trigger type	File trigger	
File generation	600 files in 1m 40s	100 labels to each printer
File trigger performance	600 triggers without delay	(200 per trigger)
Maximum print job queue	299 jobs	
Job entry to spooler	3m 2s	
Printer performance	3 printers printed labels slower than they were processed	
Summary	600 labels / 3m 2s	3 printers could not print as fast as the jobs were processed, causing a delay

NWE6 (simple label)

Triggers used	6	(each trigger monitoring one folder)
Label Type	Simple	
Print threads	6	
Trigger type	File trigger	
File generation	600 files in 1m 40s	100 labels to each printer
File trigger performance	600 triggers without delay	(100 per trigger)
Maximum print job queue	57 jobs*	
Job entry to spooler	1m 41s	(zero delay)
Printer performance	2 printers printed labels slower than they were processed	
Summary	600 labels / 1m 41s	2 printers could not print as fast as the jobs were processed, causing a delay

*The print list was filled in the beginning until the print engine was started up, and immediately after that, it emptied. This means that the system performed optimally; furthermore, it was not at its full capacity and could print additional labels before the print list would become congested.

NWE6 (complex label)

Triggers used	6	(each trigger monitoring one folder)
Label Type	Complex	
Print threads	6	
Trigger type	File trigger	
File generation	600 files in 1m 40s	100 labels to each printer
File trigger performance	600 triggers without delay	(100 per trigger)
Maximum print job queue	86 jobs**	
Job entry to spooler	1m 58s	(minimal delay)
Printer performance	Only 2 printers printed labels as fast as they were processed**	
Summary	600 labels / 1m 58s	

**The system performed near its optimal capacity, as the list of print jobs increased while the NiceEngine was being started, but has not increased afterwards. The jobs entered the spooler (for all printers) in 1 min 58 s, which means there was almost no delay in the printing. In this test, only 2 printers managed to print without delay. 4 printers could not keep up with the system's speed, 2 printers finished printing with a 1 minute delay, while the last 2 printers had a significant delay.

Test Result Table

The time measurements of test cases – the green color indicates the engine-processing times of the tests, the blue color indicates prints with no delay, and red color indicates printer-induced delays.

				Last print job enters the print engine						**Time until printer finishes printing the last label**					
Name	Triggers	Threads	Created files	Pr. 1	Pr. 2	Pr. 3	Pr. 4	Pr. 5	Pr. 6	Pr. 1	Pr. 2	Pr. 3	Pr. 4	Pr. 5	Pr. 6
NW simple	00:00	00:00	01:41	06:44	06:47	06:47	06:46	06:45	06:48	06:44	06:47	06:47	06:46	06:45	06:48
NW complex	00:00	00:00	01:42	07:32	07:32	07:35	07:33	07:34	07:35	07:32	07:32	07:35	07:33	07:34	07:35
NWE1 simple	00:00	00:00	01:42	02:35	02:35	02:36	02:36	02:35	02:36	02:35	02:50	02:36	02:36	06:58	02:36
NWE3 simple	00:00	00:00	01:42	02:36	02:37	02:36	02:37	02:36	02:36	02:36	03:00	02:36	02:37	07:05	02:36
NWE3 complex	00:00	00:00	01:43	03:01	03:01	03:02	03:01	03:01	03:02	07:24	03:20	03:02	03:01	07:10	03:02
NWE6 simple	00:00	00:00	01:42	01:41	01:42	01:41	01:41	01:41	01:41	01:42	01:41	01:42	02:07	07:00	01:41
NWE6 complex	00:00	00:00	01:43	01:57	01:57	01:57	01:57	01:58	01:57	07:25	03:13	01:57	03:00	07:02	01:57

Additional Resources

Additional documentation is available, detailing the performance tests of the multithreading and dedicated engine scenarios in a distributed printing environment. As any detailed documentation of these processes also depends on the individual solution, the examples and workflows in additional specific documentation are based on NiceLabel products and the NiceLabel methodology of enterprise-level label printing performance and automation. The documents are available at **http://www.nicelabel.com/Learning-center.**

Performance White Papers:	▪ White Paper: Understanding the Essential of Label Printing Performance
General NiceLabel resources	▪ NiceLabel Web site Learning Center ▪ NiceLabel Tutorials ▪ NiceLabel Technical FAQ ▪ NiceLabel Technical Support site ▪ NiceLabel forums

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