White Paper

File and Networking Services

Performance Test Report: Novell iPrint Appliance 1.0

Novell®

Executive Summary

This report presents Novell® iPrint Appliance job-rendering performance results that Novell testers observed while conducting tests to capture and illustrate the relationships between typical print-traffic scenarios and iPrint Appliance ecosystems. Several variables can contribute to print traffic, including job volumes, specific formats and submission rates.

The iPrint Appliance ecosystem contains multiple Windows renderers, including single- and dual-core based Windows renderers. The primary relationships between print traffic and iPrint Appliance are job-rendering and job-wait times. To establish these relationships, testers used the iPrint server's built-in audit log to track job submissions, rendering times, formats and sizes. This document contains information about the test environment, the tests and the test results.

NOTE: *Novell iPrint exists as both a part of Novell Open Enterprise Server and as a standalone software appliance. The tests in this document are applicable only to Novell iPrint Appliance 1.0.*

1—Introduction

This document provides information about performance results from several tests Novell conducted. The report focuses on the times it took to print jobs that a mobile device submitted to a printer. In each test, iPrint Appliance receives a print job from a mobile client and sends it to one or more internal or external renderers to convert the job to a print-ready state. Testers considered several parameters for running these tests:

- *Print job size*
- *Print job format*
- *Internal LibreOffice rendering*
- *External Windows rendering*

- *Multiple external Windows renderings*
- *CPU- and file I/O-intensive security-compliance applications such as antivirus software*

Testers incorporated antivirus software during testing and used the built-in iPrint auditing function to derive test results.

The results in this report do not indicate internal or external renderers' maximum performance capabilities. Novell conducted the tests to achieve the following goals:

- *Understand rendering performance in different job submission scenarios*
- *Arrive at the optimal number of Windows renderers required for different job loads*

2—Overview

Novell iPrint eliminates complex printing environments. Leveraging the industry-standard Internet Printing Protocol (IPP), iPrint provides instant global access to all your printing resources via a web browser. It's easy to find a printer on a graphical office map, download drivers, and create the printer on your Mac, Windows or Linux workstation. Your users can send documents to the printer from any application on the desktop and can add printers without an administrator account. Novell iPrint does not require any new hardware.

Users can also print documents to remote printers using an existing Internet connection. Novell iPrint includes auditing capabilities and works with various third-party accounting programs to illustrate printing environments. Your organization can use this information to charge departments for their printing costs or institute green initiatives to reduce paper consumption. Because iPrint simplifies the printing process, users are more self-reliant and do not raise helpdesk requests. Novell iPrint Appliance can also save time for your IT staff by being a small, virtual appliance that staff members can upload to a system in minutes.

Mobile Printing
Printing normally requires drivers to convert documents into printer-ready languages. Some vendors use cloud services to convert documents from mobile devices, but iPrint Appliance does not require you to send documents through a cloud service and does not require any specific hardware. By keeping information out of the cloud, iPrint Appliance is highly secure. It also allows users to use their current infrastructures and avoids vendor lock-in. Novell iPrint Appliance contains its own rendering and conversion capabilities, which allow it to receive print jobs from a variety of mobile sources.

For more information, see the *Novell iPrint Appliance Administration Guide* at: **www.novell.com/documentation/iprint-appliance1/**

3—Configurable Test Variables
Testers used the following parameters and conditions for the tests:

Job Size: Testers considered file sizes ranging from a few KBs to MBs for printing from mobile devices. They tested on both external and internal renderers and incorporated various file sizes into the test matrix to understand typical wait times for users submitting these jobs.

Job Format: Testers used different job formats to study time-taken-to-render performance with internal and external renderers.

Internal LibreOffice Rendering: LibreOffice is an open source application that Novell bundles with iPrint Appliance as an internal renderer. Testers tested the LibreOffice renderer with its supported file formats. For more information about the file types LibreOffice supports, see the *Novell iPrint Appliance Administration Guide* at: **www.novell.com/documentation/iprint-appliance1/**

External Rendering (Windows Renderer): Windows renderer is a Windows 7 system that is configured with Microsoft Office, Adobe Acrobat X Pro and iPrint Windows rendering client, then registered to an iPrint Appliance. Because this setup contains two different applications, testers tested the supported formats for both applications. Adobe supports Portable Document Format (PDF) and Microsoft Office supports several proprietary and open source formats. For more information about iPrint Appliance formats for Windows Office, see the *Novell iPrint Appliance Administration Guide* at: **www.novell.com/documentation/iprint-appliance1/**

Multiple External Windows Rendering: iPrint Appliance supports multiple external renderers, which means your administrators can register one or more Windows 7 instances to iPrint Appliance. This type of iPrint Appliance configuration does not incur additional format support. The rendering time improves with the addition of each external renderer, thereby reducing the time taken to print. For more information on performance improvements with additional renderers, see section 6, "Tested Scenarios."

Antivirus Applications: You install iPrint Windows renderers on Windows machines. Enterprises usually have several applications installed on systems for security compliance—antivirus (AV) solutions, for example. AV scans are processor intensive, so testers ran tests on iPrint Windows renderers with AV solutions installed and running.

Job Submission Rates:
- **Normal Load:** *Testers created and submitted jobs of different volumes for a period of one hour (60 minutes)—100 jobs per hour and 500 jobs per hour, for example. They emulated this job traffic from the current page per minute (PPM) handling capability of enterprise-class printers, defining these loads as normal loads.*
- **Peak Load:** *By definition, peak-load traffic occurs over a short duration during which job-submission rates go very high, thereby stressing the printing subsystem and increasing users' wait times. This test's purpose was to capture the wait time of the last job across single to multiple Windows renderers. Testers tested peak loads of 100–1000 jobs.*

4—Test Methodology
Testers' primary objective was to show the results of different appliance setups pertaining to different factors—such as multiple Windows renderers and hardware requirements—that would help improve job wait times. Areas outside the test scope included

mail-arrival latency and network bandwidth between mobile devices and the iPrint Appliance server. Rather than include these areas in their job-submission workflows, testers identified areas over which iPrint Appliance has control in the submission process to uncover potential bottlenecks and understand the impacts of having additional resources, such as multiple processors.

NOTE: *Testers used this test environment to its maximum potential. The numbers they achieved with these tests provide a good inference pattern that can help companies decide on their ideal setups.*

To obtain accurate results and ensure their reliability, testers used the following methods:

1. Due to the controlled nature of the setup, testers considered alternate print methods for simulating print job submission via Mobile app to the iPrint Appliance. The job submission mechanism needs to be tested in a controlled environment for calculating accurate reference values and stating which testers did not consider email jobs because several factors can lead to inconsistent mail transaction time in enterprise mail subsystems thereby, causing inaccuracy in reference values.
2. Testers recorded the time until print gateways submitted the jobs to the printers. (The time printers take to print depends on the makes and models of the printers. Therefore, testers did not account for this time.)
3. The test bed and setup used a 1 GBps LAN network.
4. Testers used VMware ESX 4.0 for deploying all appliances in the test.
5. Testers used the Windows 7 Enterprise 64-bit operating system created as a virtual machine for configuring external renderers.
6. Testers submitted jobs using iprintman via IPP to emulate normal-load and peak-load job traffic.
7. Testers used audit logs for each participating printer to capture these parameters:
   a. Job_submission_time
   b. Job_completion_time
      Using a and b, testers calculated:
   c. Wait time for jobs
   d. Total submission time
8. Peak-load tests submitted jobs continuously until the jobs reached a count limit.

9. Testers also used mixed sets of jobs that included both types of loads (normal and peak) for file types belonging to both internal and external renderers. The ratio of each category was as follows:
   a. 60 percent jobs for Windows renderer (50 percent PDF and 50 percent Microsoft Office documents)
   b. 40 percent jobs for LibreOffice renderer (75 percent images and 25 percent LibreOffice documents)
10. Testers performed no management functions with Management Console or iManager when tests were running.

5—Test Lab Design

Test Bed

iprint_app_wp-v01_Niche2.docx

Internal Renderer	LibreOffice
External Renderer Configuration	■ Windows 7 Enterprise 64-bit configured with Microsoft Office 2010 Standard Edition ■ Adobe Acrobat X Pro ■ Symantec antivirus client
Tools	iPrint audit logs
Client Servers	Modified iprintman for job submission in five different servers
Number of scenarios tested	Six

IMPORTANT: *Make sure that iPrint Appliance running in ESX server has sufficient physical memory present. As a best practice, the ESX server hosting this appliance should have around 2 GB of additional memory free.*

Server Hardware Details

Testers used machines with single-core and dual-core CPUs for testing:

NOVELL iPRINT APPLIANCE

Table 5-1: Server Specifications

Test Server	iPrint Appliance
Server Role	Appliance Server
Make and Model	Open Virtualization Format (OVF) deployed in VMware ESX running on Dell PowerEdge R510
CPUs/Cores	1
Memory	4 GB
Operating System	Modified Novell Open Enterprise Server 11 SP1 with mobile iPrint RPM

Table 5-2: ESX Server Hardware Details

CPU	Intel Xeon 2.7 GHz processor 6 processor cores per socket
Memory	16 GB
Hard Disk	925 GB
LAN Speed	1 GBps

EXTERNAL RENDERER

Table 5-3: Workstation Specifications

Test Server	Renderer
Server Role	Windows renderer
Make and Model	Virtualized Windows 7 in VMware ESX abstracted on Dell PowerEdge R510
CPUs/Cores	1
Memory	4 GB
Operating System	Windows 7 Enterprise 64-bit on ESX server

Table 5-4: ESX Hardware Configuration

CPU	Intel Xeon 2.4 GHz processor 4 processor cores per socket
Memory	8 GB
LAN Speed	1 GBps

6—Tested Scenarios

Printing Time for Set of 10 Jobs for Multiple Windows Renderers, with Fixed Period of 60 Minutes
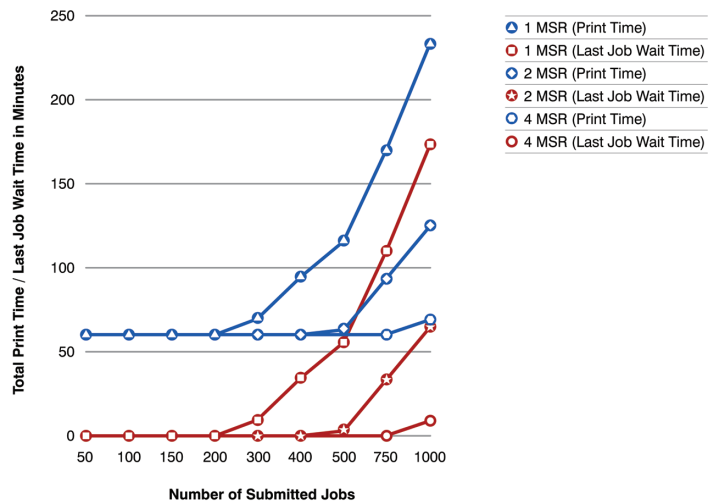
Testers performed this test with the following variables:

- *Set of 10 different jobs:*
  - 5 PDFs (1 MB, 2 MB, 3 MB, 4 MB, 5 MB)
  - 2 DOC (500 KB, 1 MB)
  - 1 XLS (100 KB)
  - 2 PPT (1 MB, 2 MB)
- *Number of Windows Renderers—Tested with 1, 2 and 4*
- *Number of Jobs—Tested with 100, 200, 300, 400, 500, 750 and 1000 submitted over an hour*

Unless otherwise specified, the printing and wait times listed in the following tables are in minutes, rounded to the nearest whole minute.

Table 6-1: Results

Number of Jobs per 60 Minutes		1 Windows Renderer	2 Windows Renderers	4 Windows Renderers
100	Printing Time	60	60	60
	Wait Time for 100th Job	0	0	0
200	Printing Time	60	60	60
	Wait Time for 200th Job	0	0	0
300	Printing Time	70	60	60
	Wait Time for 300th Job	10	0	0
400	Printing Time	95	60	60
	Wait Time for 400th Job	35	0	0
500	Printing Time	116	63	60
	Wait Time for 500th Job	56	3	0
750	Printing Time	172	94	60
	Wait Time for 750th Job	112	34	0
1000	Printing Time	234	125	69
	Wait Time for 1000th Job	174	65	9

Legend:
- 1 MSR (Print Time)
- 1 MSR (Last Job Wait Time)
- 2 MSR (Print Time)
- 2 MSR (Last Job Wait Time)
- 4 MSR (Print Time)
- 4 MSR (Last Job Wait Time)

Y-axis: Total Print Time / Last Job Wait Time in Minutes
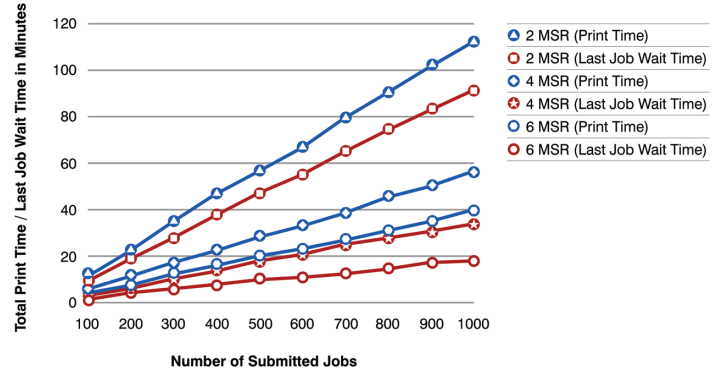
X-axis: Number of Submitted Jobs

Printing Time with Set of Five Jobs, Peak Load, for Multiple Windows Renderers

Testers performed this test with the following variables:

- *Mixed set of five different jobs:*
  - 2 PDFs (168 KB, 10 Mb)
  - 1 DOC (630 KB)
  - 1 XLS (39 KB)
  - 1 PPT (70 KB)
- *Number of Windows Renderers—Tested with 2, 4 and 6 Windows renderers*
- *Number of Jobs—Tested with 100, 200, 300, 400, 500, 750 and 1000 jobs submitted continuously*

Table 6-2: Results

Number of Jobs		2 Windows Renderers	4 Windows Renderers	6 Windows Renderers
100	Printing Time	11	6	4
	Total Submission Time	2	2	2
	Wait Time for 100th Job	9	4	2
200	Printing Time	23	11	8
	Total Submission Time	4	4	4
	Wait Time for 200th Job	19	7	4
300	Printing Time	34	17	12
	Total Submission Time	6	6	6
	Wait Time for 300th Job	28	11	6
400	Printing Time	46	22	16
	Total Submission Time	8	8	8
	Wait Time for 400th Job	38	14	8
500	Printing Time	57	28	20
	Total Submission Time	10	10	10
	Wait Time for 500th Job	47	18	10
600	Printing Time	67	33	23
	Total Submission Time	12	12	12
	Wait Time for 600th Job	55	21	11
700	Printing Time	79	39	27
	Total Submission Time	14	14	14
	Wait Time for 700th Job	65	25	13
800	Printing Time	90	45	31
	Total Submission Time	16	17	16
	Wait Time for 800th Job	74	28	15
900	Printing Time	101	50	35
	Total Submission Time	18	19	18
	Wait Time for 900th Job	83	31	17
1000	Printing Time	112	56	40
	Total Submission Time	21	22	22
	Wait Time for 1000th Job	91	34	18

Printing Time for Mixed Set of Jobs (Windows and LibreOffice Renderers) for Multiple Windows Renderers, Normal Load for Different Job Volumes

Testers performed the test with the following variables:

- *Mixed set of 10 different jobs:*
  - 3 PDFs (13 MB, 4 MB, 5 MB)
  - 1 DOC (1MB)
  - 1 XLS (100 KB)
  - 1 PPT (2 MB)
  - 1 ODT (100 KB)
  - 3 images (JPG, TIF, PNG—3 MB, 5 MB, 5 MB)
- *Number of Windows Renderers—Tested with 1, 2 and 4*
- *Number of Jobs—Tested with 100, 200, 300, 400, 500, 750 and 1000 jobs submitted over an hour*

Table 6-3: Results

Number of Jobs per 60 Minutes		1 Windows Renderer + 1 Libre-Office Renderer	2 Windows Renderers + 1 Libre-Office Renderer	4 Windows Renderers + 1 Libre-Office Renderer
100	Printing Time	60	60	60
	Wait Time for 100th Job	0	0	0
200	Printing Time	60	60	60
	Wait Time for 200th Job	0	0	0
300	Printing Time	61	60	60
	Wait Time for 300th Job	1	0	0
400	Printing Time	77	60	60
	Wait Time for 400th Job	17	0	0
500	Printing Time	91	63	60
	Wait Time for 500th Job	31	3	0
750	Printing Time	132	71	60
	Wait Time for 750th Job	71	11	0
1000	Printing Time	177	94	0
	Wait Time for 1000th Job	117	34	0

Printing Time for Mixed Set of Jobs (LibreOffice Only), with Fixed Period of 60 Minutes, for Different Job Volumes

Testers performed this test with the following variables:

- *Mixed set of 10 different jobs:*
  - *7 images (JPG, BMP, PNG, TIF—Size between 1 and 5 MB)*
  - *1 ODT (100 KB)*
  - *1 ODP (500 KB)*
  - *1 ODS (100 KB)*
- *Number of Jobs—Tested with 500, 750 and 1000 jobs submitted over an hour*

Table 6-4: Results

Number of Jobs per 60 Minutes		Single Thread LibreOffice Renderer
500	Printing Time	60
	Wait Time for 500th Job	0
750	Printing Time	60
	Wait Time for 750th Job	0
1000	Printing Time	60
	Wait Time for 1000th Job	0

Printing Time for Single Job (LibreOffice Only), Submitted Continuously for Different Page Counts

Testers performed this test with the following variables:

- *Number of Pages—ODT files with 100 and 200 pages*
- *Number of Jobs—Tested with 1, 100, 200, 300, 400, 500, 600, 700, 800, 900 and 1000 sets*

Table 6-5: Results

Number of Jobs Submitted		ODT File of 100 Pages	ODT File of 200 Pages
1	Printing Time	2 Seconds	4 Seconds
100	Printing Time	2	4.5
	Total Submission Time	1	1
	Wait Time for 100th Job	1	3.5
200	Printing Time	4.5	9
	Total Submission Time	2.5	2.5
	Wait Time for 200th Job	2	4.5
300	Printing Time	7	14
	Total Submission Time	4	4
	Wait Time for 300th Job	3	10
400	Printing Time	9	18.5
	Total Submission Time	5	5
	Wait Time for 400th Job	4	13.5
500	Printing Time	11.5	23
	Total Submission Time	6.5	6.5
	Wait Time for 500th Job	5	16.5
600	Printing Time	13.5	28
	Total Submission Time	8	8
	Wait Time for 600th Job	5.5	20
700	Printing Time	16	32
	Total Submission Time	9	9
	Wait Time for 700th Job	7	23
800	Printing Time	18	37
	Total Submission Time	11	11
	Wait Time for 800th Job	7	26
900	Printing Time	20.5	41.5
	Total Submission Time	12.5	12.5
	Wait Time for 900th Job	8	29
1000	Printing Time	23	46
	Total Submission Time	16	16
	Wait Time for 1000th Job	7	30

Printing Time for Mixed Set of Jobs for Windows Renderer in a Single-Core CPU vs. Dual-Core CPU with Antivirus Implemented

Testers performed this test with the following variables:

- *Set of 10 different jobs:*
  - 5 PDFs (1 Mb to 5 MB)
  - 2 DOCs (500 KB, 1 MB)
  - 2 PPTs (1 MB, 2 MB)
  - 1 XLS (100 KB)
- *Number of Windows Renderers—1*
- *CPU Cores for Windows Renderer—1 core and 2 core*
- *Antivirus—With and without full computer scan running*
- *Number of Jobs—Tested with 100, 200, 300, 400, 500, 600, 700, 800, 900 and 1000 job sets*

We rounded the times in other tables to the nearest minute. We did not round the times in table 6-6 to demonstrate the negligible difference between the times.

Table 6-6: Results

Number of Jobs Per 60 Minutes		1 Windows Renderer— 1 Core CPU	1 Windows Renderer— 2 Core CPUs
100	Printing Time	21	21
	Total Submission Time	1.75	1.75
	Wait Time for 100th Job	19.3	19.25
200	Printing Time	41.5	42.75
	Total Submission Time	3.5	3.5
	Wait Time for 200th Job	38	39.25
300	Printing Time	63.25	64.75
	Total Submission Time	5.25	5.25
	Wait Time for 300th Job	58	59.5
400	Printing Time	84.75	86
	Total Submission Time	7	7
	Wait Time for 400th Job	77.75	79
500	Printing Time	105.5	107.75
	Total Submission Time	8.75	8.5
	Wait Time for 500th Job	96.75	99.25
600	Printing Time	127	129.75
	Total Submission Time	10.5	10
	Wait Time for 600th Job	116.5	119.5
700	Printing Time	148.75	151.5
	Total Submission Time	12.25	11.75
	Wait Time for 700th Job	136.5	139.75
800	Printing Time	169	172.5
	Total Submission Time	14	13.5
	Wait Time for 800th Job	155	159
900	Printing Time	190.5	194.25
	Total Submission Time	16	15
	Wait Time for 900th Job	174.5	179.25
1000	Printing Time	212.25	216.75
	Total Submission Time	18.25	17.5
	Wait Time for 1000th Job	194	199.25
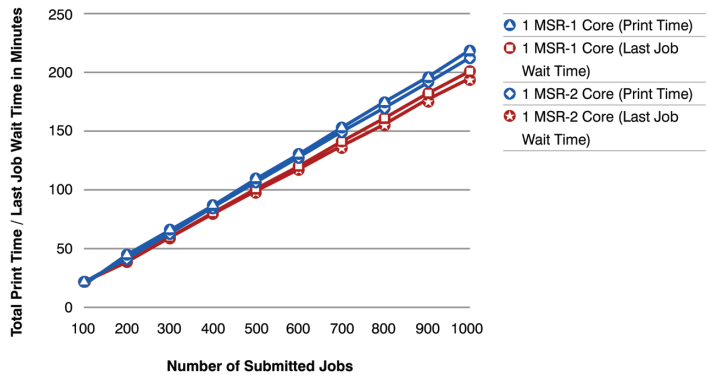
Table 6-7: Results

Number of Jobs		1 Windows Renderer— 1 Core with Antivirus Full Scan Running	1 Windows Renderer— 2 Cores with Antivirus Full Scan Running
100	Printing Time	32	26
	Total Submission Time	2	2
	Wait Time for 100th Job	30	24
200	Printing Time	65	52
	Total Submission Time	4	4
	Wait Time for 200th Job	61	48
300	Printing Time	96	79
	Total Submission Time	6	6
	Wait Time for 300th Job	90	73
400	Printing Time	130	105
	Total Submission Time	8	8
	Wait Time for 400th Job	122	97
500	Printing Time	161	133
	Total Submission Time	10	10
	Wait Time for 500th Job	151	123
600	Printing Time	192	158
	Total Submission Time	12	12
	Wait Time for 600th Job	180	146
700	Printing Time	225	184
	Total Submission Time	14	14
	Wait Time for 700th Job	211	170
800	Printing Time	256	210
	Total Submission Time	16	16
	Wait Time for 800th Job	240	194
900	Printing Time	289	237
	Total Submission Time	18	18
	Wait Time for 900th Job	271	219
1000	Printing Time	320	264
	Total Submission Time	21	21
	Wait Time for 1000th Job	299	243
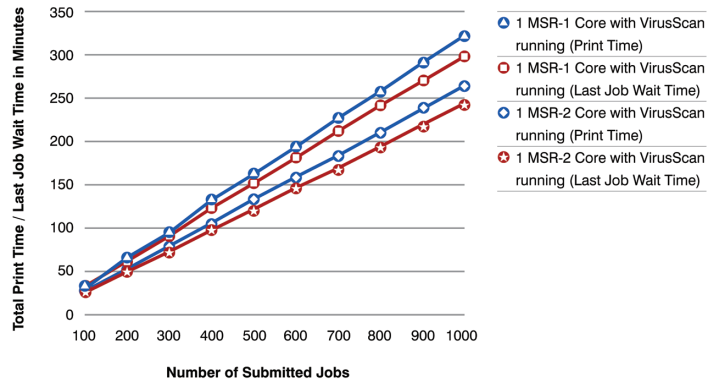
With most organizations, company policies mandate security applications like antivirus, monitoring tools and so forth. Testers found antivirus client scans the most CPU and file I/O intensive, so testers checked the impact on rendering performance while an antivirus scan was running. They concluded that with a single-core system, data indicates performance degradation, whereas with a dual-core system, the results were comparable to the results seen for tests run without antivirus scans running.

Average Print Time for Different File Formats and Different File and Page Sizes
The following table provides an idea of the time it took iPrint Appliance to print different file formats:

Table 6-8: File Formats

File Size	ODT (LibreOffice)		DOC (Windows Renderer)		PDF (Windows Renderer)	
	Total Pages	Total Print Time in Seconds	Total Pages	Total Print Time in Seconds	Total Pages	Total Print Time in Seconds
100 KB	54	3	21	8	6	9
500 KB	156	4	117	16	100	12
1 MB	283	8	256	24	6	12
5 MB	5	4	7	9	8	37
10 MB	12	6	14	12	12	59
20 MB	17	12	27	17	14	55

7—Conclusions

Based on the test results, Novell can classify iPrint Appliance performance into three different categories. The tests show that each category has an average-load and peak-load handling capability for maintaining Quality of Service (QoS). QoS refers to the wait time to print a job. Testers calculated average loads for job submissions on a 10-hour window per day. The loads calculated for increased job-submission rates over short spans of time are termed *peak loads*. Chapter 4 ("Test Methodology") and Chapter 5 ("Test Lab Design") mention the test environment and methodologies.

In the following table, the time iPrint Appliance took to render a single print job ranges from 1–180 seconds, depending on the average load for each category.

For example, if your print environment falls into Category 1 as defined in the table, and the average load is up to 1500 print jobs per day, then the time taken to render a single print job is one second. As the average load increases to 2000 jobs per day, the time taken to render a single print job increases, and can go up to 180 seconds depending on the job size.

Table 7-1: Load Handling Capability

Category	Setup	Average Load	Peak Load
Category 1	iPrint Appliance + 1 External Renderer	1500–2000 print jobs per day	75–100 jobs in 30 minutes
Category 2	iPrint Appliance + 2 External Renderers	2000–4000 jobs per day	100–250 jobs in 30 minutes
Category 3	iPrint Appliance + 4 External Renderers	5000–10,000 jobs per day	250–500 jobs in 30 minutes

Novell iPrint Appliance modularity has the ability to maintain rendering time under acceptable limits by scaling up external renderers. Testers achieved better rendering performance when they optimized wait times for increased job volumes by adding external renderers. Normal-load test results with single and multiple renderers define iPrint Appliance job-handling capabilities, which can help administrators determine the number of external renderers your organization will require for optimally handling print loads within acceptable job wait times.

Peak-load test results provide an overview of the last job wait time for single and multiple renderers with varying job volumes. These results can help administrators more precisely determine the number of external renderers your organization will need, depending on the occurrence of peak loads in your environment.

Based on the data they collected for the most likely printing scenarios, Novell testers have plotted charts and graphs to help your system administrators understand external renderer requirements for an optimal rendering experience.

For more information, see the *Novell iPrint Appliance Administration Guide* at: **www.novell.com/documentation/iprint-appliance1/**

**Contact your local Novell Solutions
Provider, or call Novell at:**

1 800 714 3400 U.S./Canada
1 801 861 1349 Worldwide

Novell, Inc.
1800 South Novell Place
Provo, UT 84606 USA

www.novell.com

Novell