



# Technical White Paper. **Performance and the Prinect Workflow 2021.**



# Prinect.

## Optimizing your performance.

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**Improving performance is often about eliminating the things that negatively impact performance.** But performance is very subjective and sometimes comes at a cost, so a printer may weigh the additional cost over the additional performance. There is an adage: The enemy of “Good Performance” is not “Bad Performance,” it is “Good Enough Performance.” When you do something “Good Enough” you are settling for less than the best performance you can get. Commonly, most printers will only address performance issues when the volume of employee complaints exceeds a threshold or when the boss is waiting for something and it is taking longer than they would expect.

This white paper discusses the Heidelberg Prinect® Workflow and how to identify and address performance-related issues. If you do not feel comfortable implementing any of these steps in your shop, please consult with an IT Professional or Heidelberg Professional Services to assist you. Please note that some of these suggestions may result in temporary downtime to facilitate a reboot so they should not be implemented during normal production hours. In addition, these suggestions are expected to be done by someone familiar with IT-related changes and issues. As such, they do not fall under the normal product support capabilities of the Heidelberg Technical Help Desk so you should not be calling in to get assistance modifying or troubleshooting your environment.

### Some things to consider:

- Heidelberg always recommends that you run the Prinect Production Manager on the fastest hardware in your workflow. If you purchase a newer server for your workflow – to add an application or replace older, failing hardware – it is better to rehost the Production Manager software to that newer, faster server rather than installing a different workflow application on that server. The existing Production Manager server can then be repurposed to another workflow application or even some business application in your plant that is currently running on older, slower hardware and would benefit from improved performance. This may take longer initially during the installation process but will pay off in the long run with day-to-day production performance. We have an informative document entitled "Heidelberg Prinect Workflow Hardware Refresh 2020" that goes into detail on the comparisons between different generations of hardware.
- The Prinect Production Manager can handle very large files like 1-bit TIFFs and high-resolution 4-color, imposed PDF files as well as very small files like JDF and XML files. So, if you make tuning adjustments that are designed for, as an example, a server used for Office 365® applications which typically deal with small files, the results may not produce the desired improvement you are looking for.
- In general, Prinect is Network I/O and Disk I/O bound; however, certain applications can be more CPU intensive or use more memory. For example, the Renderer uses a relatively high amount of memory and CPU when it is rendering. This may determine if you need to consider running the Renderer on its own server rather than on the Production Manager.
- Heidelberg Servers have been optimized for the Prinect Workflow. This means during Deployment the BIOS settings and Microsoft® Windows™ settings have been tuned for Prinect.

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Summary

# What causes bad performance?

Performance is not always about improving the performance but, often, it is about eliminating the things that negatively impact performance. You can always throw more hardware at a problem like faster CPUs, using all SSDs, 40-GbE, etc., but if the root cause of your performance issues is infrastructure or misconfiguration, this may not even help. Negative performance is generally caused by one of the following reasons:

- 1 Client and/or Server Health:** This can be the result of using old servers or not properly maintaining your servers, failing hardware, or using dated or incompatible software. This does not just mean Prinect but other important servers to your environment such as your Active Directory Server. When a customer provides their own hardware or uses a Virtual Machine, under-configuration comes into play; particularly as newer software is released, and the hardware is not maintained to accommodate the new requirements. It is vital to keep your software current in order to take advantage of the latest productivity enhancements as well as any fixes for issues that effect performance. This includes Windows and Mac OS®, your Prinect software, Adobe Acrobat® Professional, any anti-virus or backup software, etc.
- 2 Poor or incorrectly configured infrastructure:** This can be caused by “Prioritization” where some traffic gets allocated a higher priority than the rest of the applications using a given network path. These types of things can negatively impact network performance.
- 3 Viruses or unwanted software:** There are all kinds of security measures put in place to scan for viruses, encryption, and Intrusion Prevention Systems (IPS) that can negatively impact performance. Sometimes there are settings or exclusions that can be implemented that minimize the effect of these on normal production. But sometimes the software serves no purpose and was installed unknowingly or is some legacy software no longer being used. These should be removed. Anything not essential to production should not be used on your workflow components. Consuming hardware resources like memory, CPU Cycles, network bandwidth and disk space, they can introduce security holes that can be exploited.
- 4 Network Time Protocol:** The NTP Server of the Press must be identical to the NTP Server of the Prinect Server for Push to Stop to work. Everything that is part of the Heidelberg Prinect Workflow should use the same NTP Server. NTP is important to your Domain Controller because it controls the authentication of all network activities (start and end of user’s sessions, access controls for various services such as shared folders or proxy navigation, etc.). If the time is off, the Kerberos Session Tickets will not get authenticated. In addition, NTP time servers ensure precise time for Cloud services to maintain accurate and reliable time, so no matter where users are in the world, the Cloud service can ensure the correct time is logged preventing data loss and errors.

Finally, the NTP Server is important for virtualization. A Virtual Machine (VM) can get its time from the Virtual Host system, which in many situations may be sufficient. However, VMs that are members of a Domain are also instructed to get their time from the Domain. It is important to determine one authoritative time source for VMs. It is preferred to have the Domain manage the time and have the VMs not sync to the Virtual Host.

- 5 DNS Response Time:** Most customers won't know it's their DNS that is slow or misconfigured, but it has a direct impact on how they perceive the performance of their workflow in general, i.e., poor DNS performance results in poor Prinect performance. Prinect uses host names as the form of communication between components.

Make sure the DNS is internal and that all workflow equipment name server settings are the same. Avoid setting the DNS to the IP address provided by your ISP or Google® DNS. If no internal DNS exists, use your Firewall as the DNS assuming it has this feature and is enabled.

Make sure the Primary and Secondary DNS Servers are configured identically and are correct. A lot of time can be wasted when a Prinect component attempts to look up host names in DNS that have the wrong current IP address. This not only impacts performance but can also cause workflow to fail.

- 6 Where the DNS servers are located directly impacts latency. If it is multiple Switches away or on a different Subnet and must go through a router, things will be slower.

If the DNS server is not scaled correctly, this can result in a negative impact on DNS latency. DNS Servers should have a lot of memory and a fast network. Newer implementations require more CPU when you use features like DNSSEC. The memory should be sufficient to hold both the cache and the zones loaded from disk. Also use the latest software. The DNS Server should be running Windows Server 2019 or Windows Server 2016. [It is not unusual for Heidelberg to find a customer still running Windows 2003 or Windows 2008 for their DNS.] Typically, the DNS server is run on your Active Directory Server unless you are a very large business that has a dedicated DNS Server. You also will want two of them running for redundancy.

**Domain Policies:** If your Heidelberg Prinect Workflow is joined to your Domain, you should consider the impact of the Domain policies on performance. In general, Prinect operators require full access to files and folders of the prepress servers. If you have a Domain policy that limits access for some reason, it could not only impact performance, but also reliability.

# Troubleshooting.

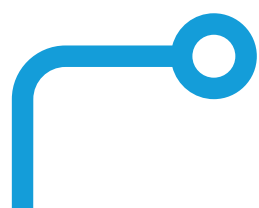


**One of the more difficult challenges is waiting too long to troubleshoot the cause of your poor performance.**

Unfortunately, it is not uncommon for someone to report slowdowns and when you ask when this started the answer will be “sometime last year”. In such as case, you lose the ability to track what changed before the performance difficulties started. Do not try to resolve issues without any backup information. Ask yourself, what is slow, when did it start, is it isolated to one computer, is it isolated to one user, is it a Mac or a Windows client, etc.

**Here are some basic troubleshooting steps you can take to begin your investigation:**

- ➔ Run a benchmark, for example, transferring a large file or a bunch of small files from one workstation to the server and vice-versa, launch Cockpit and see how long it takes. This will be helpful in establishing as a baseline to gauge if you have improved the situation after making any further changes. I personally like to eliminate the Workflow from the equation initially by checking performance at the Operating System level. You can also eliminate a particular server or client by connecting to the same cable and seeing if the performance issue still exists which could point to the underlying infrastructure.
- ➔ Maintain a log to see if you can identify any patterns such as a particular computer or operator, or the frequency and duration of the performance issue when it is intermittent.
- ➔ Examine the logs like Windows Event Viewer and any logs in your network appliances like LAN Switches to look for potential errors or warnings that may point you in the right direction. Therefore, Heidelberg recommends using a Managed Switch so you can get information from the Switch in troubleshooting.
- ➔ Avoid chasing issues that may already be resolved by first updating BIOS and Firmware, drivers, and Windows and PMC updates for Prinect.
- ➔ Check network issues from the bottom up (i.e., make sure the cable is good and not loose, damaged, or a connector with the plastic piece that secures it is not broken off).
- ➔ Ensure backups are not scheduled to run during production hours. This can be a big performance killer.
- ➔ When the performance issue is related to a workstation, remember that there are additional channels open to you to get possible solutions. It may be worthwhile to open a call with Apple® or Microsoft or the manufacturer of your workstation hardware (such as HP®, for example) to see if they have any guidance.



# Network I/O & Disk I/O.

**The network can be a big culprit when it comes to poor performance.** The problem is that networks tend to work but by “work” it means it can communicate from one device to another – that doesn’t mean it works as fast as it should. But you can’t really see (without special tools and knowledge) what is happening on the wire, so you don’t know if there are input/output errors, collisions, packets dropped or retransmitted, etc.

- 1 Network congestion can occur when the path becomes saturated. When this happens, packets cannot be transferred in a timely manner, so they are either dropped or queued. It may also affect the ability to set up new sessions. What happens will depend on the level of delay caused by the congestion.
  - If packets are delayed, latency will increase, and some retransmissions can occur.
  - If packets are dropped, then retransmission increases significantly: as packets are not acknowledged, they will then be resent.
  - If too many packets are dropped, sessions will be dropped.
- 2 Network latency is the time needed to send a packet from the source to the destination. This time varies depending on the physical distance, the number of network devices which packets must pass through (sometimes called the number of hops), and the performance of each of the devices. For TCP applications like Prinect, latency will have a drastic impact.

Starting with the Dell® PowerEdge™ 640, 10-GbE is now included as standard. The use of 10-GbE not only increases bandwidth but can help reduce latency and congestion. Please refer to our paper “Using 10-GbE with Prinect 2020.10” for more detailed information on this topic. Alternatively, you can try Adapter Teaming with multiple GbE ports.

Also, if you refer to our paper on [Network Guidelines: Prinect Production Manager](#) it stresses that everything involved in the Workflow should be on the same physical Network Switch to avoid multiple hops. With each Switch, the packet must examine the Packet Header to obtain the destination MAC Address, so it knows which switchport to forward the packet.

**Disk I/O can also be a significant factor in the performance of your Heidelberg Prinect applications.** There are several factors such as the Disk Controller, the PCIe Bus, the RAID level, and the drives themselves. These all have Firmware and Drivers as well as various settings that can affect performance. There is always the trade-off of performance versus security of your data versus costs. In general, with HDDs having smaller capacity but more spindles in a RAID 0 would be faster, but if you lose a drive you are done and HDDs with higher capacity have a lower cost per GB. So, you must find a balance where you get the performance you need and security you need at a price point that is palatable.

First and foremost, you should always make sure you have free space on your disk volumes to allow the software to perform as expected. Normally, I recommend you always have 20% free space: particularly on the System drive (Drive C:).

One metric you can use to estimate the performance of your storage is IOPS (Input/Output Operations Per Second). IOPS is the number of read/write operations with a storage, disk, or a file system per a time unit. The larger this number is, the greater the performance of your storage. However, you cannot judge performance by IOPS alone. It must be considered along with other metrics such as latency, throughput, etc. The latency times should not exceed 30 milliseconds at 90% of the workload on the system hard drives, The megabytes per second should not be less than 180 MB/s, and the IOPS with 4k or 8k block size and 25% write access should not be less than 2,500 IOPS. This is particularly important if you provided your own hardware or are running on a Virtual Machine.

Microsoft recommends using the DiskSpd utility for generating a load on a disk and measuring its performance. This is a command line interface tool that can perform I/O operations with the specified drive target in several threads. DiskSpd can measure the storage performance and get the maximum available read/write speed and IOPS from the specific server. DiskSpd can be downloaded from <https://github.com/microsoft/diskspd/releases/tag/v2.0.21a>

# Prinect Application Servers.

The Prinect applications are generally configured to meet the needs of most customers. But there are always customers that have a much higher volume of data they process, more users, more Proofers/Platesetter, etc. Here are some things to consider:

**Database:** Typically, Microsoft SQL Server, Express Edition is used for database applications like Analyze Point, Prinect Portal, Prinect Archive System, Business Manager, etc. In most cases, this is sufficient; however, Express Edition will only use 1 processor for the database and is limited to a database file size of 10-GB and a maximum memory of 1410-MB. If the database is the bottleneck, you can improve performance by using Prinect Data Center which uses Microsoft SQL Server, Standard Edition. Prinect Data Center will run on its own Server or VM thus offloading it from the Prinect Application Server where it can consume hardware resources that could be utilized by Production Manager.

**Prinect Maintenance Center:** The Prinect Maintenance Center (PMC), by default, is installed on the Production Manager Server. While this is fine in most cases, this can be offloaded to another server to free up any network bandwidth or disk space it uses.

**Renderer:** Many customers run a Production Manager One Box configuration with a built-in Renderer and CTP Direct Port. You can run the Renderer on a separate server and/or add a Prinect Shooter 2 to distribute the load depending on the volume of proofs and plates you run.

**Prinect Archive System:** If you have Prinect Archive System, consider archiving jobs that are not needed. Archiving dormant jobs will remove them from the PTjobs share. The fewer job folders on this volume, the better the performance.

**Delete outdated sequence templates:** Old sequence templates that refer to host names or network volumes that no longer exist tends to slow down Cockpit performance when jobs are initially open. This is because Cockpit will try to verify that the network paths defined in the sequence exists, which costs time.

**Performance Pack:** Some engines in Prinect Workflow can be scaled, i.e., you can add more licenses to Prinect that will allow the software to do more things in parallel. For example, if you have a license that allows activating only one Normalizer or Trapping engine, you may find that jobs tend to rest in the Normalizer queue of Cockpit. The Normalizer engine will process one thing at a time. If you add a second Normalizer engine, Prinect can process two things at a time. The same concept applies to Preflight. If you notice that jobs in Cockpit are queued but held up in the Preflight queue, you could add a Preflight engine license to enable multitasking. Customers with a Prepress Manager license that are under contract, can purchase the Performance Pack option. For customers with Production Manager, the Performance Pack is free, but it isn't licensed automatically free, it has to be requested. **NOTE:** Before adding Performance Packs, you should check the total memory available. Adding Performance Packs with low memory on the server or VM can decrease performance. The recommendation is 64-GB for servers using several Performance Packs.

## Summary:

With increased performance, jobs go through the automatic print manufacturing process faster so you can produce more jobs. The faster turnaround will undoubtedly increase customer satisfaction as well as reduce employee frustration.

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