



PrintFleet Page Counts Overview

PageTrac Support

PageTrac Page Counts Overview

Page count calculations are more complex than they might seem. This paper will discuss the issues related to page counts, list the constraints and complications, and explain how PrintFleet Enterprise deals with them.

Life Count

In terms of page counts, the only metric that a printing device is capable of reporting is one that covers the entire life of the device. PrintFleet refers to such a value as a *Life Count*.

By itself a Life Count value has limited usefulness. It can:

- Indicate how much use a device has seen.
- Help predict when a device may be ready for replacement.

The Life Count value cannot answer questions such as:

- How many pages did a device print this month?
- What was the most active device this year?

Page Count

To answer time-based questions you obviously need to know when the pages were printed. As the device is unable to provide this information by itself, PrintFleet has to create it. It does this by recording a time stamp whenever a device reports a new Life Count value.

For example, suppose a Printer Data Collector Agent (DCA) is set up to poll a network every half hour. At 9:00 a printer reports that its Life Count value is 3036. At 9:30 the same printer reports that its Life Count value is 3048, and at 10:00 the value has increased again to 3052. PrintFleet maintains this information in a database. We can imagine the database looking something like the following:

Life Count	Time
3036	9:00
3048	9:30
3052	10:00

With a little bit of math and the ability to perform queries on the time stamp information, PrintFleet is able to provide users with a calculated metric to indicate how many pages were printed during a specified period. PrintFleet refers to this value as simply a *Page Count*.

Color Devices

Color devices typically report two page-count metrics: Life Count, and *Life Count - Color*. The Life Count value includes all pages printed over the life of the device, both black-and-white and color, whereas the Life Count - Color value is the total number of color pages printed by the device over its lifetime.

Various reports in PrintFleet also display a *Life Count - Mono* metric. This is a calculated metric that PrintFleet determines by subtracting the Life Count - Color value from the Life Count value.

Multi-Function Devices

Multi-function devices (those that can print, copy, scan, and fax), typically have many page-count metrics associated with them, such as:

- Total
- Mono (Total)
- Color (Total)
- Fax
- Scan
- Copier Mono
- Copier Color
- Print Mono
- Print Color

As with color devices, PrintFleet receives some of these as direct reports from the device, while others are calculated metrics.

Storage

We have a choice in how to store the life count information in our database. We can either store every report, regardless of whether the values have changed, or we can store just the reports for which the values have changed.

For example, suppose our hypothetical printer is idle from 10:00 to 1:00. Every half hour during that time it dutifully reports back to the Printer DCA the same Life Count value (3052). Eventually at 1:15 it prints another 10 pages, which is reflected in the new Life Count value it reports at 1:30.

We could store this information in either of two ways as shown in the tables below:

Storing All Reports	
Life Count	Time
3036	9:00
3048	9:30
3052	10:00
3052	10:30
3052	11:00
3052	11:30
3052	12:00
3052	12:30
3052	1:00
3062	1:30

Storing Changed Reports	
Life Count	Time
3036	9:00
3048	9:30
3052	10:00
3062	1:30

The table on the left may appear to contain more information, but there is nothing in that table that cannot be inferred from the more compact table on the right. By using clever algorithms, PrintFleet is able to store all the information it needs while reducing the database space requirements for a typical printing device by approximately 90%.

Another significant benefit of having both the DCA and the PrintFleet database storing the reports in this way is that it is easy to maintain the integrity of the reports. If a DCA loses its connection to PrintFleet, it continues to receive reports from the devices, and can update the database with this data once it reconnects. Even if something unusual happens, such as having different DCAs reporting on the same device at different times, the time stamp will ensure that the reports are inserted in the database in the correct order.

This storage method also helps PrintFleet detect and deal with anomalies such as when the Life Count value for a device is reset to 0. See *Handling Resets* for more information.

Calculating Page Counts

It is worth noting that when PrintFleet determines how many pages were printed within a specified period, it must use the first value before the start of the date range as the starting value. For example, suppose we wanted to know how many pages were printed in July and our database included the following information:

Life Count	Date/Time
4815	June 28, 9:30
4837	July 2, 11:45
4845	July 4, 6:00
4849	July 8, 8:30
4861	July 8, 11:30
4868	July 14, 5:00
4874	July 22, 7:15
4883	July 29, 4:45
4895	August 3, 2:30

We want to subtract the number of pages printed as of the start of the month (July 1) from the number of pages printed as of the end of the month (July 31). The last pages to be printed in July were printed on July 29, so we can use the corresponding Life Count value (4883) as the end-of-month total. The first pages to be printed in July were printed on July 2. You might assume that we should therefore use the corresponding value of 4837 as our start-of-month total, but 4837 is the number of pages printed as of 11:45 on July 2. If we were to use that value we would be omitting the pages that were actually printed on July 2. To find the number of pages printed as of the start of the month (12:00 AM on July 1), we instead need to look at the last record prior to that date. In our example database that would mean using 4815 as our start-of-month total—the value corresponding to June 28.

Handling Resets

Consider a device that has a Life Count value of 103,405 at the beginning of the month. The value increases to 103,920 before being reset to 0, and eventually climbs to 508 by the end of the month.

Some PrintFleet competitors use a simple "end minus start" calculation. With this method you would get a monthly page count of -102,897, which is useless.

Each time PrintFleet Optimizer receives a new Life Count report for a device, it first uses the time stamp to insert the report into the appropriate row of the table for that device, and then performs an integrity check to verify that the table values make sense. If an anomaly is detected (such as a Life Count value decreasing from one date to the next), PrintFleet makes the necessary adjustments to ensure the Life Count remains as accurate as possible.

This versatile robust algorithm will also handle multiple resets in a time frame, as well as other scenarios.

Potential Complications

With devices typically using just one meter to report page count values, you might think there is little that could go wrong. Surprisingly, there are several scenarios that can occur which will throw off the page count calculation. These scenarios include:

- The Life Count can be reset to 0, and start over from there.
 - This can happen when changing certain parts (depending on the model), or if the device's memory is erased for some reason.
- There can be erroneous counter values, causing a large positive or negative spike.
 - Some devices occasionally do not respond correctly, respond with 0, or respond with other garbage data while they are busy or sleeping.
 - DCAs prior to 3.2.2 could be configured to scan a broadcast address, and did not check the response to ensure it came from the device that was asked. When an SNMP request is sent to a broadcast address, most devices will respond to that request. The DCA would only check that the data was what was asked for, so if any device responded to the request, it would use that as the data value. Since the MAC address is also requested this way, potentially "device A" could respond to the MAC address request, "device B" could respond to a meter request, and "device C" could respond to a different meter request. In this case the life count values for "device B" and "device C" would be added to the database table for "device A".
- The count can jump back and forth between two ranges of values.
 - This can happen when two DCAs are scanning the same device, and one DCA is an older version that does not properly read the meters from the device.
 - It can also happen when two DCAs are scanning the same device, and the times are significantly different on their host PCs—one will start loading values into the database with a different (wrong) scan time, mixing accurate counts with the wrong time with accurate counts with the correct time.
 - If there are two devices that both report to the same PFE server, and have the same MAC Address, the DCA can mix the values together causing similar behavior.
- The count can occasionally go back a few pages.
 - Some devices only store their life count values to non-volatile memory every 10 pages (HP is known to do this with some models). If the DCA scans when it reads 11,120, then 11,129 and then the device is power cycled, the next time it is scanned (without printing any pages) it would read 11,120. After another 11 pages are printed, it would read 11,131. Without correcting for this only 11 pages would be counted, when in reality 20 pages were printed.

Fortunately these scenarios arise very infrequently. For most devices, they will never occur. If they do, PrintFleet has taken steps to minimize their impact to ensure they will not cause major problems, and is always working toward further improvements.

