Whitepaper

Video Performance Guarantee Profile 4

Version 1.0

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Revision History

Revision	Date	Description
1.0	2024-10-31	Initial Version

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1. What is Video Performance Guarantee (VPG)?

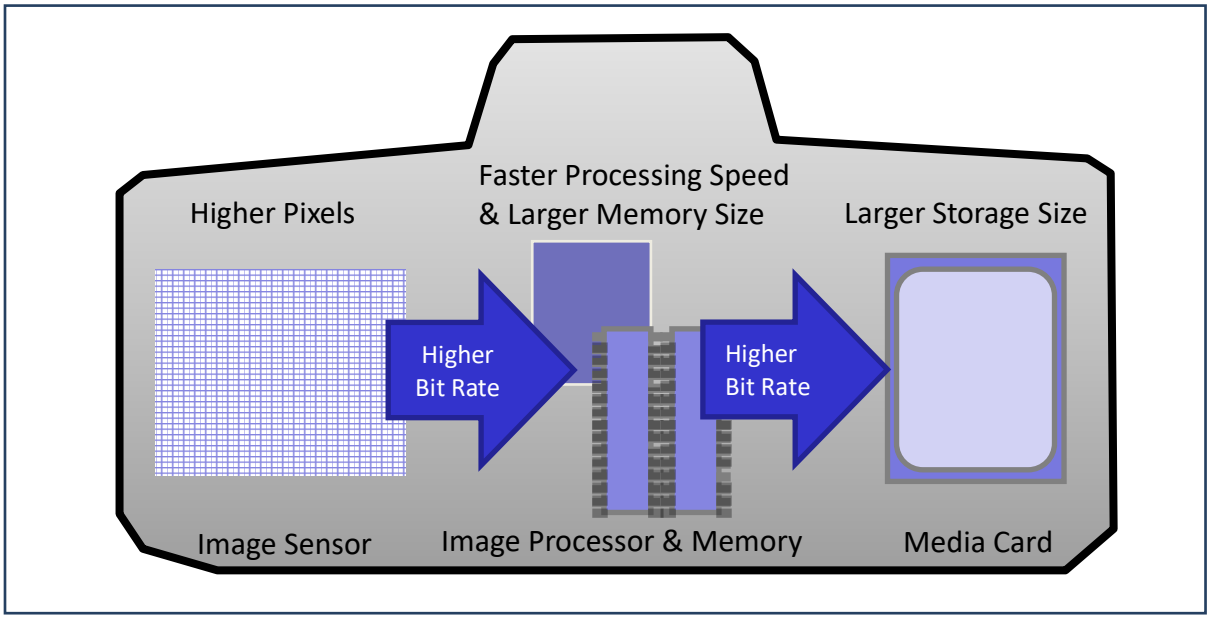
Video Performance Guarantee (VPG) is a standard established by the CompactFlash Association (CFA) to ensure media cards capture high-data-rate video without dropping frames. VPG, with tight coupling between the camera and media card, guarantees minimum sustained write performance for recording high-quality video.

The current iteration of VPG is VPG Profile 4, or VPG4, that was standardized in April 2019. VPG4 defines two classes for CFexpress media cards to capture streaming video: VPG400 for 400MB/s sustained write speed, and VPG200 for 200MB/s sustained write speed. The VPG400 and VPG200 are certified by CFA and media cards that are VPG-rated are designated by the logos below found on CFexpress cards.

2. Why is VPG Needed?

Video cameras, including still cameras with video-recording capability, 1) capture video footage by the image sensor, 2) send the data through their internal data bus, 3) process the data with the image processor and internal memory (Random Access Memory or RAM), and ultimately 4) write files onto the media card (Flash Memory).

Higher resolution, higher frame-rate, and higher dynamic range all contribute to higher bit rate (data rate) that needs to be passed through to the media card and recorded with extremely high sustained write operations regardless of compressed or RAW video streams.



Unlike PCs or embedded applications which read and write small files at random locations of the storage element with no restrictions on read/write time, video cameras capture streaming video in real-time which needs to be recorded by the media card at the same or greater bit rate as the incoming video data stream with no delay. This requires a much more rigorous write operation by the camera and media card so no frames are dropped (data lost).

Video Performance Guarantee ensures that the media card is capable of recording video streams with extremely high data rates by allowing it to be more tightly coupled with the camera to extract guaranteed write performance characteristic of video recording. You can say that Video Performance Guarantee establishes a 'contract' between the camera and media card for guaranteed performance. These contracts are defined as Profiles within VPG.

Profiles create a set of operational guardrails in order to 1) ensure the media card has large contiguous portions of flash memory, 2) ensure optimal stream recording boundaries are established, and 3) communicate this information between the media card and the camera. This will allow guaranteed write performance without the camera's internal buffer memory overflowing resulting in lost frames.

New Profiles are being defined in CFA as technology progresses. Every new Profile allows greater sustained write performance for video streaming. The table below outlines past VPG Profiles that were standardized in CFA:

VPG Profile	Classes	Guaranteed Sustained Write	Underlying Standard
Profile 1	VPG20	20MB/sec	CompactFlash and CF+ v4.1
Profile 2	VPG65	65MB/sec	CompactFlash and CF+ v5.0 CFast v2.0 XQD v1.10
Profile 3	VPG130	130MBsec	CFast v2.0
Profile 4	VPG200	200MB/sec	CFexpress v2.0
	VPG400	400MB/sec	CFexpress v2.0

3. How is a VPG CFexpress Card Different from an Ordinary CFexpress Card?

As stated above, media cards that support VPG Profiles are guaranteed to perform as defined for video capture. This provides a level of insurance for users, especially professionals, who cannot afford the time and cost of 'retakes' due to failed video recordings.

Cards with VPG logos are certified by CFA as opposed to self-certification of other CFA standards. The media card manufacturer will conduct the test of their candidate product according to CFA's testing specification using a CFA-approved tamper-proof tester, and the test report is submitted to CFA for final review and certification. This extra layer of scrutiny by an unbiased party ensures that the media card will perform as guaranteed. The VPG logos are certification marks from CFA ensuring that the cards will perform against the specified VPG Profile.

Inside a CFexpress card, its firmware holds data that describes the characteristics of the card. One such datum is the VPG Flag. This flag is set to 1 if the CFexpress card supports VPG and 0 if it doesn't. Accordingly, there should be a one-to-one correlation between the VPG Flag being set and the CFexpress card being VPG-certified.

However, this is not always the case. Even though a CFexpress card is not VPG-certified, the card may have the VPG Flag set either by the manufacturer's error or by nefarious reasons. Since the card was never submitted for VPG certification, CFA cannot identify these cards until they become endemic in the market. This poses risk to the end user.

The VPG Flag is used by camera manufacturers to identify that a media card guarantees VPG operation for camera modes that require it. Although cards without VPG-certification may work (for a while), there is no guarantee that it will do so; remember, the "G" in VPG stands for "guarantee". If the card has the VPG Flag set without being VPG-compliant, there is a high chance that the media card will fail during video recording. The resulting symptom may be dropped frames, or worst case, camera shutdown. This is unacceptable for end users as well as CFA breaching the trust of the entire ecosystem.

In order to address this, CFA has created a database of cards that have been VPG-certified. The list can be found in CFA's website at:

https://compactflash.org/video-performance-guarantee-vpg/

This list is updated in real-time as new media cards from CFA members are VPG-certified, and camera manufacturers refer to this database for recommending media cards for their cameras requiring VPG. It is strongly recommended that end users check their camera manual whether VPG is required and selecting a media card from this database.

4. Conclusion

Video Performance Guarantee (VPG) is a specification that has been established specifically for video capture to ensure guaranteed write performance without dropping frames. This is particularly important for end users that cannot afford time and cost of retakes due to failed video recordings. Cards with the VPG logo are certified by CFA providing an extra layer of insurance that the cards will perform as guaranteed. Products that are VPG-certifed by CFA can be found at: https://compactflash.org/video-performance-guarantee-vpg/