Release Notes (EN)
PGC-1000 Grabber Card
Rev. 1.8.0

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01 Introduction

01.1 Definitions and Abbreviations

Term/Abbreviation	Definition
PGC	PLC2 Grabber Card
PL	Programmable Logic (FPGA)
QSFP	Quad Small Form-factor Pluggable
MAC	Media Access Control
PC	Personal Computer
CPU	Central Processing Unit
PCIe	Peripheral Component Interconnect Express
MHD GeFe	Measurement and Hardware in the Loop Device Generic Frontend
UDP	User Datagram Protocol
TCP	Transmission Control Protocol
FW/SW	Firmware/Software
PDF	Portable Document Format

01.2 References

The PGC-1000 User Guide can be found on *www.plc2.com*

The PGC-1000 Software User Guide can be found on *https://www.plc2.com/*

01.3 Product Documentation

The PGC-1000 product documentation in PDF format can be found on *www.plc2.com*.

02 Product Definition

02.1 Functions at a Glance

The PGC-1000 is a high performance, camera data stream capable PCIe® card with up to 40 Gbit/s Ethernet via a short-range QSFP+ connector in total. It is ideally suited to enable high-end multi-camera video data logging and replaying on mid-performance PCs, to avoid the need for costly, very high-end multiprocessor computers.

Feature list for recording use case combined with Windows driver and library:

- Ethernet camera data offloading

  As its major purpose, the PGC-1000 Grabber Card takes the burden of video streaming protocol termination from the Host-PC CPUs.

- Video control interfaces (Networking Data)

  On its 10G interfaces, the PGC-1000 supports camera data protocols. This is for instance used to configure the ethernet camera devices (e.g. the MHD GeFE) and to start the acquisition for the recording use case.

- Video streaming interfaces for video capture, single stream

  On its 10G interfaces, the PGC-1000 supports camera data streaming. It is used to stream a single video data stream per 10G interface to the host PC over the PCIe interface. The PGC-1000 takes care of the video streaming protocol termination so that the host application must deal with raw payload data only.

- Network interfaces

  The 10G interfaces of the PGC-1000 Grabber Card each provide a subset of typical network interface protocols. For instance, *ping* can be used to check connection. UDP and TCP can be used with some restrictions.

- Total streaming throughput (PGC-1000 inbound) of at least 2x8 Gbit/s

  The PGC-1000 Grabber Card works with MHD GeFE with at least two 10G interfaces up to 2x8 Gbit/s. It has also been tested with all four 10G interfaces receiving data up to nearly 10 Gbit/s.

- PCIe transfer rate of up to 64 Gbit/s

  The incoming maximum of total 40 Gbit/s is transferred over a PCIe 3.0 x8 lanes towards the host PC memory. There is enough margin to the PCIe interface capacity of 64 Gbit/s so that this cannot become a bottleneck.

- Attestation signed driver for Windows 10 version 2004 and for Windows 11. Driver for Linux Ubuntu 22.04

  The PGC-1000 Grabber Card is accompanied by a signed Windows driver for Windows 10 version 2004 and for Windows 11. The Windows and linux drivers supports up to four 10G interfaces and has been thoroughly tested and released with two 10G interfaces corresponding to one MHD GeFE.

- C++ PGC-1000 software library for MD and MT runtime as debug and release

  The PGC-1000 Grabber Card and Windows driver are accompanied by a software library to expose the application programming Interface to the user application.

- One software camera (with optional network functionality) per available network interface

  The PGC-1000 software library provides one local software camera (with network functionality) per available network interface. The associated API functions can be used to develop own host PC application code without the necessity to acquire real data over the 10G interfaces of the PGC-1000 Grabber Card.

  Please note: the optional network functionality is a beta feature. Performance and functionality may vary with used network adapter.

- Updater for PGC-1000 Grabber Card firmware

  An updater tool is provided in addition to the PGC-1000 Grabber Card, Windows driver, and library. It runs on the host PC and can update the FW/SW on the PGC-1000 Grabber Card itself when it is plugged into a PCIe 3.0 x8 lanes slot of the host PC.

02.2 General Description

02.2.1 System Prerequisites

The following minimum system prerequisites must be met:

Required Hardware	Intel Architecture Processor or AMD Architeture Processor
Required Operating System	Windows 10 Version 2004 or Windows 11 or Linux Ubuntu 22.04

02.2.2 Software Prerequisites

The PGC-1000 software library is compiled with Platform Tools v142 targeting Platform Version `10.0.19041.0`. This or another compatible (newer) version is needed to use the software library. The Headers of the libpgc1k library utilize multiple C++17 features.

02.2.3 Release Test Configuration

The release passed all Microsoft Driver Verification tests with standard configuration.

02.2.4 Restrictions

Certain network issues and side effects can arise if a firewall is used. Please exclude your libpgc1k application from your firewall. Libpgc1k uses network broadcast and multicast functionality. Libpgc1k uses in its default configuration the UDP ports described in the GigeVision (Version >= 2.0) Standard.

02.2.5 Miscellaneous

There are no miscellaneous items which must be described.

02.3 Installation

The installation procedures are described in the following documents:

Document	Version
PGC-1000 User Guide	1.4.1
PGC-1000 Software User Guide	1.4.0

02.4 Licensing

There is no license necessary.

02.5 Version Information

This release has the following version:

- Release 1.8.0

The components of this release have the following versions:

Component	Version
Firmware	3.3.0
Libpgc1k	4.0.3
Host Driver Windows 10	4.0.0
Host Driver Windows 11	4.0.1
Host Driver Linux Ubuntu	4.0.0
PGC Updater	1.1.2

02.6 What is New

02.6.1 General

This release provides the following new features:

- Support for Linux Ubuntu 22.04
- Support for Windows 11
- Bug fixes

02.6.2 Libpgc1k

- Added various function overloads that take an interface name instead of a hardware address to make working with them easier for Linux users.

- Added a is_interface_registered function that checks if an interface is registered.

- Genicam interface now checks register and memory capabilities and automatically changes its behavior to match the capabilities of the camera.

- Log messages from the network library are now handled by the event system. Fatal problems from the network library are now translated to libpgc1k exceptions / events.

- A gev_cam::get_all_nodes_and_interfaces function that returns all available GenICam nodes and interfaces of a camera as strings.

- New event_id::camera_failed event that is triggered when a camera has failed because of a communication or synchronisation error.

- New event_id::init_done that is triggered when the library init is done.

- Added a pgc1k::pgc_config option to turn on the debug output of the network library

- New class based camera API. Old camera namespace functions are deprecated and will be removed in one of the next releases. The old functions are marked with [[deprecated]] and trigger MSVC warning C4996. Using the /sdl compiler option elevates this warning to an error.

  Refer to https://learn.microsoft.com/en-us/cpp/error-messages/compiler-warnings/compiler-warning-level-3-c4996

- Genicam get_genicam_root and find_* functions are now deprecated. Use the functions from the gev_cam class instead. The old functions are marked with [[deprecated]]

- gvcp register/memory read/write functions are now deprecated. Use the functions from the gev_cam class instead. The old functions are marked with [[deprecated]]

- Changed all pgc1k::softcam::get* functions to return a gev_cam class instead of the deprecated camera_data_t struct.

- Changed the return type of pgc1k::util::check_firmware_update_file to int32_t and updated its documentation.

- Removed event IDs "event_id::camera_map_init_failed" and "event_id::event_pool_init_failed"

- Changed util::check_firmware_file to only take a path as argument

- Changed FIO functions to use the new camera class

- The interface of register_native_interface has changed. It now has a parameter to dissable native gvsp reception. Native gvsp reception is disabled by default. (It is not needed for running a software camera)

02.6.3 Driver

Driver Windows 10

- Improved Network TX path performance

- Compatibility changes for libpgc1k 4.0.0
- Possibility to have > 32 stream slots for fifo

Driver Windows 11

- Windows 11 version of the driver. At least Windows version 10.0.22621 needed.

Driver Linux Ubuntu

There are currently no new features available which must be described.

02.6.4 Firmware

There are currently no new features available which must be described.

02.6.5 PGC Updater

There are currently no new features available which must be described.

02.7 Compatibility to Earlier Releases

This release is not compatible with previous PGC-1000 releases.

02.8 Fixed Problems

This section describes the set of fixed problems of the released version.

02.8.1 Libpgc1k

- Fix for "Call ID: 764905 Access violation in RtlAcquireSRWLockShared". SEH exception does not occure anymore.
- Fix for "Call ID: 765562 Unhandled exception in pgc1k::write_support_file". Exception is now handled correctly.
- Fix for "Call ID: 765432 PGC-1000: pgc1k::register_native_interface(...) hangs endlessly". An exception is now thrown if you try to register an interface that is already registered (like a PGC interface).
- Fix for "Call ID: 764951 PGC1000: libpgc1k 3.4.4: Linker warnings LNK4099". Libpgc1k pdb name is now correct.
- Fixed a bug in the Genicam parser that caused wrong register addresses to be computed. Many nodes were not accessible because of this bug.
- Fixed the test packet size algorithm for MHD devices
- Fixed the test packet size function in the software camera
- Fixed an endianness issue in the software camera
- Fixed a bug that caused log events to be discarded at library deinit
- cam::wait_for_cameras returned only true if the exact amount of cameras was found, not if more than the amount was found. This is now fixed.
- Fixed a crash in the internal exception handling that occured when library init was not completed successfully
- Fixed a crash caused by mem::pgc_minimize()
- Fixed a crash caused by gvcp::discover()
- Fixed a crash that occured when a second stream was started on the software camera
- Fixed several memory leaks
- Fixed a bug that caused the heartbeat timer to not be stoppend when the software camera was removed
- Fixed a bug in the Linux version that caused high CPU load
- Fixed a deadlock in the Linux version that could occure during library init
- Fixed an MHD header type issue
- Fixed a memleak in the linux driver communication
- Fixed a memleak in the GVCP communication
- Fixed write event timeout values not working correctly in GVCP and Linux driver communication
- Fixed a rare bug that caused multiple heartbeat timers to be started.
- Fixed a bug that prevented library deinit if synchronization of a camera failed early
- Fixed a bug that caused the library to behave incorrectly if a GVCP DISCOVERY_ACK was received during library init
- Fixed a rare race condition that happened when the thread was interrupted by the scheduler while the softcam was added to the camera map.

02.8.2 Driver

There are currently no new fixed problems which must be described.

02.8.3 Firmware

There are currently no new fixed problems which must be described.

02.8.4 PGC Updater

- Fixed PGC-1000: Library initialisation failed error when PGC_Updater of libpgc1k 3.4.2 is started: this fix is a temporary solution until a better definition of the requirement is made.

02.9 Known issues

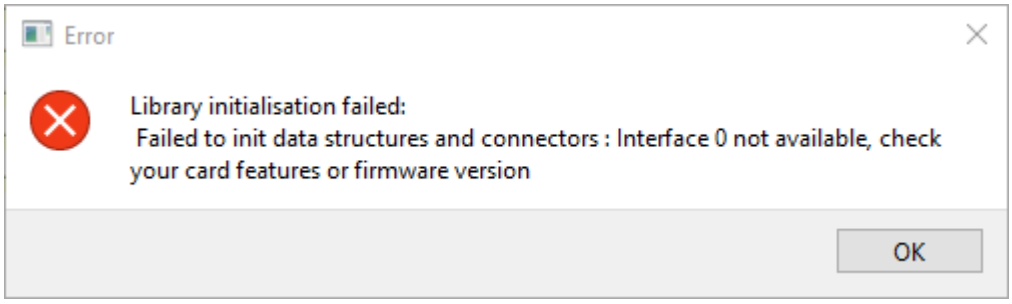
02.9.1 Release Related Items

Firmware: Pure UDP/TCP may expose lower performance or under rare circumstances lockups or packet loss.

Firmware: When the reset is done by the libpgc1k, it is possible, that old camera data remains inside the PGC-1000 card. When new camara data is received by the PGC-1000 card, the old data might be received by the libpgc1k.

Libpgc1k and PGC Driver: Multiple PGC-1000 cards in one PC are currently not supported.

PGC-Updater: Related to the call “759455 PGC-1000: Library initialisation failed error when PGC_Updater of libpgc1k 3.4.2 is started”, the following error message could appear during the flash of the firmware:



The update of the release should in that case be done from the lowest level first:

- Firmware (with the PGC Updater from the already installed release): it means that to install the firmware 330 from Release 1.6.0 you must use the PGC-Updater from previous Release 1.5.0.
- Driver
- Library

Linux Driver and library: for the time being, it is needed to rebuild the kernel with Continuous Memory Allocation (CMA) (~6GBytes). It is planned to remove this dependency for the next release.

02.9.2 Hardware Related Items

There are currently no hardware related items available which must be described.

03 Hints

There are currently no hints available which must be described.

04 Hotfix information

There are currently no hotfixes available which must be described.

05 Contact, support, and problem reporting

For contact information, support, and problem reporting, visit *www.plc2.com*.