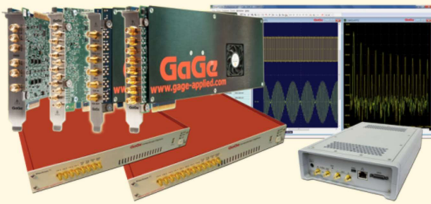# GaGe

GaGe is a worldwide industry leader in high speed data acquisition solutions featuring a portfolio of the highest performance digitizers, PC oscilloscope software, powerful SDKs for custom application development, and turnkey integrated PC-based measurement systems.

APPLICATIONS

Wideband Signal Analysis

RADAR Design and Test

Signals Intelligence (SIGINT)

Ultrasonic Non-Destructive Testing

LIDAR Systems

Communications

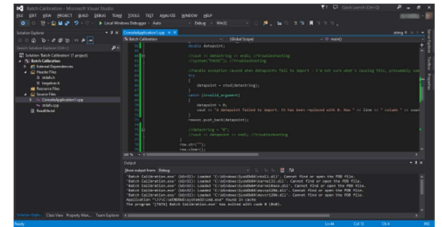Optical Coherence Tomography

Spectroscopy

High-Performance Imaging

Time of Flight

Life Sciences

Particle Physics

# CompuScope Software Development Kit (SDK) for C/C#

FEATURES

- Complete Control of GaGe CompuScope Hardware Instruments

- Support for all CompuScope Operating Modes and Configurations

- Rapid Development of Custom Applications with GaGe Instruments

- Ready-Made Compiled Sample Programs Illustrating Usage & Operation

- Advanced Sample Programs for eXpert FPGA Firmware Features

- Supports both 32-bit and 64-bit Application Development

- Windows and Linux Operating Systems Supported

- Provided C SDK Sample Programs Illustrate:

  - Single Acquisition with Full Configuration Control of Digitizer

  - Multiple Segmented Acquisitions with Multiple Trigger Events

  - Large and Deep Acquisition Size Operations

  - Complex Triggering Engine Operations

  - Operation of Multiple CompuScope Digitizers in a System

  - Signal Data Streaming to Software Analysis and to Storage

  - Signal Data Streaming to GPU Processing for Analysis or Storage

  - Repetitive Capture Performance Evaluation Operations

  - eXpert FPGA Signal Averaging Operations

  - eXpert FPGA Fast Fourier Transform (FFT) Operations

  - eXpert FGPA Optical Coherence Tomography (OCT) Operations

  - eXpert FPGA Ultrasonic NDT Position Encoder Operations

  - eXpert FGPA Digital Down Conversion (DDC) Operations

Overview

The C/C# SDK sample programs are intended to be convenient starting points around which users can develop their own customized CompuScope software applications. The overall structure of the C/C# SDK and its relation to the GaGe CompuScope hardware is represented by the following block diagram:

CompuScope C/C# SDK Block Diagram
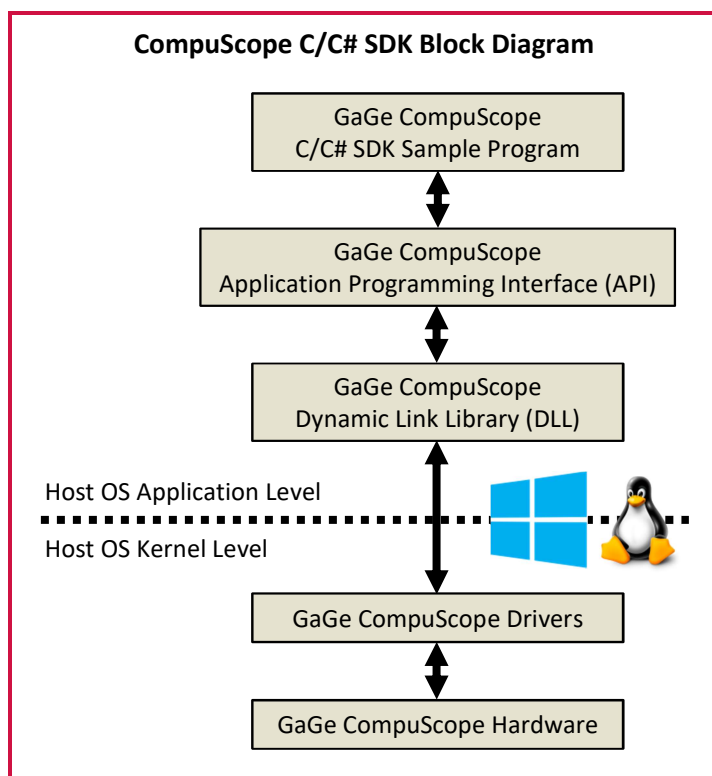
CompuScope hardware is directly controlled by the hardware driver that resides at the host operating system (OS) kernel level, which allows direct low-level access to CompuScope hardware registers and physical host PC memory.

The hardware driver communicates with software at the host OS application level through dynamic link libraries (DLLs) that are communicated to via an Application Programing Interface (API) with its set of C subroutine calls and methods.

Complete projects files for all C/C# SDK sample programs are provided for Microsoft Visual C/C++ version 6.0 or higher. Upon opening the workspace file for any C sample program, all supporting files, path specifications and build settings are automatically loaded. Compiled executable versions of all C and C# sample programs are provided with the SDK for convenience.

C# sample programs with identical functionality to the C sample programs are provided for operating CompuScope hardware in the .NET environment. .NET version 2.0 is required even if newer versions are installed.

The C sample programs may be operated under compilers other than Visual C/C++. However, complete project files must be assembled by the user and the specific compiler should be checked for other possible requirements on converting Visual C/C++ projects.

CompuScope systems are addressed from C or C# sample programs by first obtaining a handle for the system. After usage of the system is complete, the user must release the handle so that it is free for usage by other processes. By obtaining handles for different systems, a single C or C# program may simultaneously operate different CompuScope systems.

Alternately, separate C or C# programs may operate independently and simultaneously operate separate CompuScope systems by calling handles for each one. Different programs may even access the same hardware as long as one program frees the system handle before the other program obtains it. This is because different applications may not simultaneously access the same CompuScope system.

The typical basic algorithm flow for the provided C and C# sample programs is as follows:

1.) Initialize CompuScope driver and hardware.

2.) Obtain the handle to the first CompuScope system in the host PC.

3.) Obtain the desired configuration settings from the local GaGe setting files.

4.) Pass the desired configuration settings to the driver.

5.) Commit the configured settings by transferring them from the driver to the CompuScope hardware.

6.) Start the CompuScope hardware to digitize data into onboard acquisition memory and await a trigger event.

7.) Continuously check to see if the CompuScope hardware has finished the acquisition.

8.) Download the data of interest from the CompuScope hardware to a PC RAM array variable.

9.) Store the acquired data to a drive file according to the settings and file format provided in the settings file.

All C and C# sample programs acquire data from CompuScope hardware and store the results in ASCII data files with file names of the form XXX_N.DAT, where N is the channel number in the CompuScope system. These files may easily be imported into other programs for analysis and display.

C/C# SDK Basic Sample Programs

Provided basic sample programs include the following:

Sample Program Name	Sample Program Description
GageAcquire	A Single Record capture from a single CompuScope system.
GageComplexTrigger	Illustrates complex triggering methods in Single Record mode. Some CompuScope models are equipped with two onboard trigger engines that can be used for complex triggering. On these models, the two engines can be configured independently and their outputs are Boolean ORed together so that either engine may cause a trigger event.
GageDeepAcquisition	Large acquisitions from a single CompuScope system. The definition of large varies with system configuration but is roughly of order 16+ MBs.
GageMultipleRecord	Multiple Record Mode allows multiple waveforms to be rapidly acquired and stacked in onboard CompuScope acquisition memory.
GageMultipleSystem	A multi-threaded sample program for acquisition from multiple CompuScope systems.

C/C# SDK Advanced Sample Programs

Provided advanced sample programs include the following:

Sample Program Name	Sample Program Description
GageASTransfer	Illustrates asynchronous data transfers.
GageCallback	Allows the programmer to associate a callback function with notification of an event and illustrates synchronization using callbacks.
GageCsPrf	Makes a series of repetitive acquisitions using the specified settings and provides subsequent timing measurements to evaluate the repetitive capture performance of CompuScope hardware.
GageEvents	A multi-threaded sample program that illustrates usage of the notification events that can be assigned to specific operation of the CompuScope, allowing synchronization between different threads of execution.
GageFastAcquire2Disk	Acquire fast repetitive waveforms and store them as quickly as possible to drive storage.
GageMulrecFastTransfer	Acquire multiple segments of data and transfer to separate storage files.

C/C# SDK Advanced Sample Programs for GPU CUDA Processing

Provided advanced sample programs that require CompuScope model hardware and NVIDIA CUDA GPU include the following:

Sample Program Name	Sample Program CompuScope Requirement	Sample Program Description
GageAcquireThruGPU	Not Applicable	Memory Mode acquisition and transfer to GPU for parallel processing of easily inserted user developed custom code for display analysis.
GageStreamThruGPU	eXpert PCIe Data Streaming Firmware	Streaming acquisition from a single CompuScope to GPU for parallel processing of easily inserted user developed custom code for display analysis and streaming processed data results to drive storage.

C/C# SDK Advanced Sample Programs for eXpert FPGA Firmware Options

Provided advanced sample programs that require CompuScope model hardware with eXpert FPGA firmware options, or special hardware options include the following:

Sample Program Name	Sample Program CompuScope Requirement	Sample Program Description
GageAcquireDDC	eXpert DDC Firmware	Allows for digital down conversion of a single channel input signal from a carrier frequency range between 0 to 1 GHz with multiple FIR filter stages that allows for decimating data in steps of 16, 32, 64, 128, 256, 512, 1024 and 2048 with the output results optionally streamed to the host system.
GageAcquireOCT	eXpert OCT Firmware	Supports variable rate k-clocking or inactive external clock by simultaneously digitizing the interferometer signal with the returned optical signal for use with OCT applications.
GageFFT	eXpert FFT Firmware	Allows 8192 point FFT calculation analysis directly on the digitizer and transfer of multiple Fourier Spectra to the host PC in a single PCIe transfer.
GageNDT	eXpert Ultrasonic NDT Position Encoder Firmware	Allows for direct position encoder reading capability for fastest possible scan rates with Pulse On Position Mode and Position Stamping Mode for use with modern ultrasonic non-destructive testing (NDT) inspection systems.
GageSignalAveraging	eXpert Signal Averaging Firmware	Allows repetitive waveform acquisitions to be rapidly averaged in order to reduce random noise.
GageStream2Analysis	eXpert PCIe Data Streaming Firmware	Multi-threaded streaming acquisition from a single CompuScope with analysis performed on time-stamp data.
GageStream2Analysis_ Simple	eXpert PCIe Data Streaming Firmware	Simple, single-threaded streaming acquisition from a single CompuScope with analysis performed on raw waveform data.
GageStream2Disk	eXpert PCIe Data Streaming Firmware	Multi-threaded streaming acquisition from a single CompuScope with waveform data streamed continuously to drive storage for recordings.
GageStreamDDC	eXpert DDC Firmware	Provides same functionality as GageAcquireDDC but with the output results optionally streamed to the host system for analysis or storage recording. Note that eXpert DDC Firmware includes built-in PCIe Data Streaming capabilities.

GaGe

ORDERING INFORMATION

CompuScope Software Development Kit (SDK) for C/C#	Order Part Number

GaGe CompuScope SDK for C/C#
 	
NOTES:
 	
• Complete projects files for all C/C# SDK sample programs are provided for Microsoft Visual C/C++ version 6.0 or higher.
 	
• C# sample programs with identical functionality to the C sample programs are provided for operating CompuScope hardware in the .NET environment. .NET version 2.0 is required even if newer versions are installed.
 	
• The C sample programs may be operated under compilers other than Microsoft Visual C/C++. However, complete project files must be assembled by the user and the specific compiler should be checked for other possible requirements on converting Visual C/C++ projects.
 	
• SDK sample programs are natively supported on the following Linux distributions:
 	
    o Red Hat 7.0 64-bit
    o Ubuntu 16.04 64-bit
    o Ubuntu 14.04 32-bit
 	
In general, the user-mode Linux code can be ported to other Linux distribution releases with possible minor modifications to support.
	200-200-101

900 N. State St.
Lockport, IL 60441-2200

Toll-Free (USA and Canada):
Phone: 1-800-567-4243
Fax: 1-800-780-8411

Direct:
Phone: 1-514-633-7447
Fax: 1-514-633-0770

Email:
prodinfo@gage-applied.com

To find your local sales representative or distributor or to learn more about GaGe products visit:

www.gage-applied.com

WARRANTY

Standard two years parts and labor.

Unless otherwise specified, all dynamic performance specs have been qualified on engineering boards. All specifications are subject to change without notice.

Data Sheet Revision 1 – 03/12/2019

GaGe is a product brand of DynamicSignals LLC, an ISO 9001:2015 Certified Company