

# OP4610XG System Description

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## Description

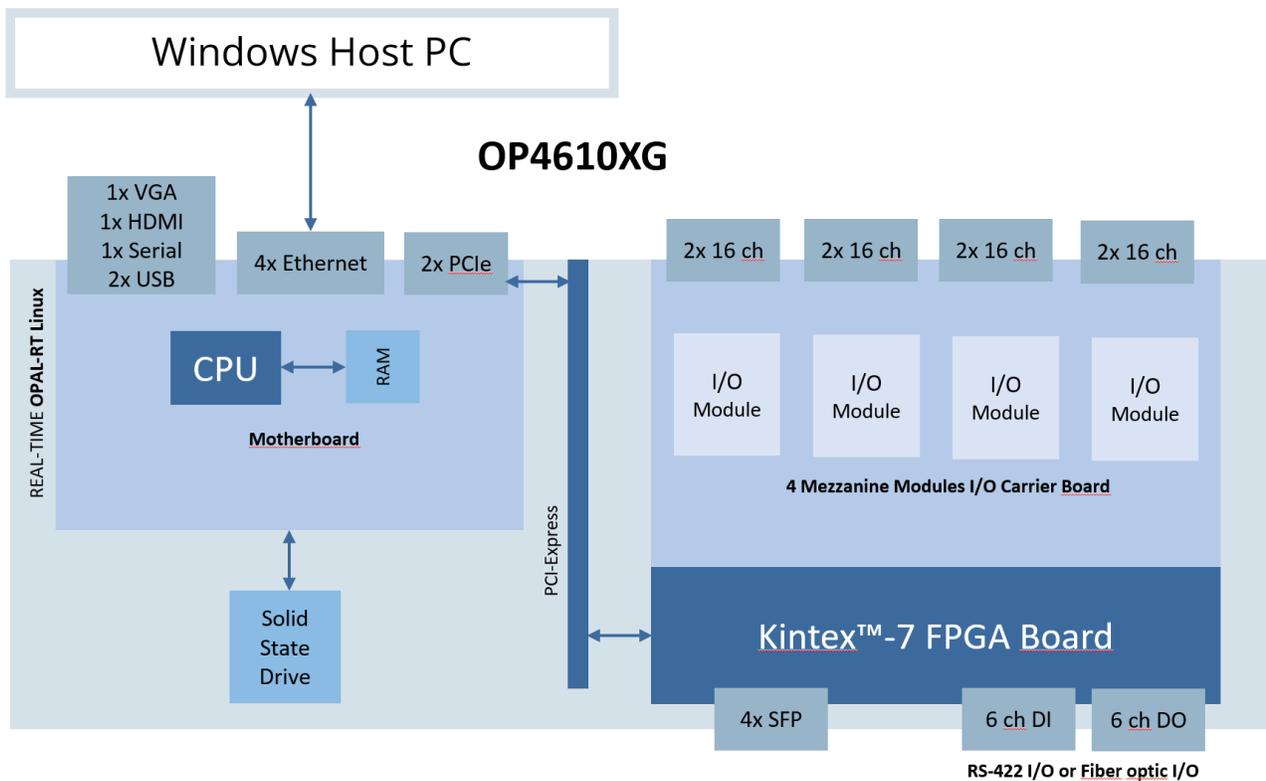
The OP4610XG is an affordable compact mid-range simulator with up to 128 fast I/O channels with signal conditioning, 12 channels for RS422 or optional low-speed fiber-optic communication, 4 high-speed communication ports (SFPs), and 2 free PCIe slots for optional I/O cards.

The integration of a high-end AMD™ Ryzen™ 6-core processor with powerful Xilinx® Kintex®-7 FPGA provides great simulation power and sub-microsecond simulation time steps to maximize the accuracy of fast power electronic systems. It is fully compatible with RT-LAB and HYPERSIM.

The OP4610XG is designed to be used either as a desktop, shelf top, or mounted in a standard 19" rack.

## Simulator Architecture

The diagram below shows the general architecture of the OP4610XG simulator.



The **front** of the chassis provides access to the **SFP ports** and the **synchronization connectors**. The **back** of the chassis provides access to the **DB37** and **DB9 I/O connectors**, **computer ports**, target **power cable**, and main **power switch**.

The main housing is divided into two sections, each with a specific purpose:

- The **lower section** of the chassis contains a powerful **target computer** that can be added to a network of simulators or can be used standalone. It is used to run simulations built with OPAL-RT's RT-LAB or HYPERSIM software simulation platform **and includes the following features:**
  - MicroATX motherboard
  - OPAL-RTLlinux real-time operating system
  - AMD™ Ryzen™ 6 cores, 3.8 GHz CPU
  - 16 GB of DRAM
  - 256 GB SSD disk

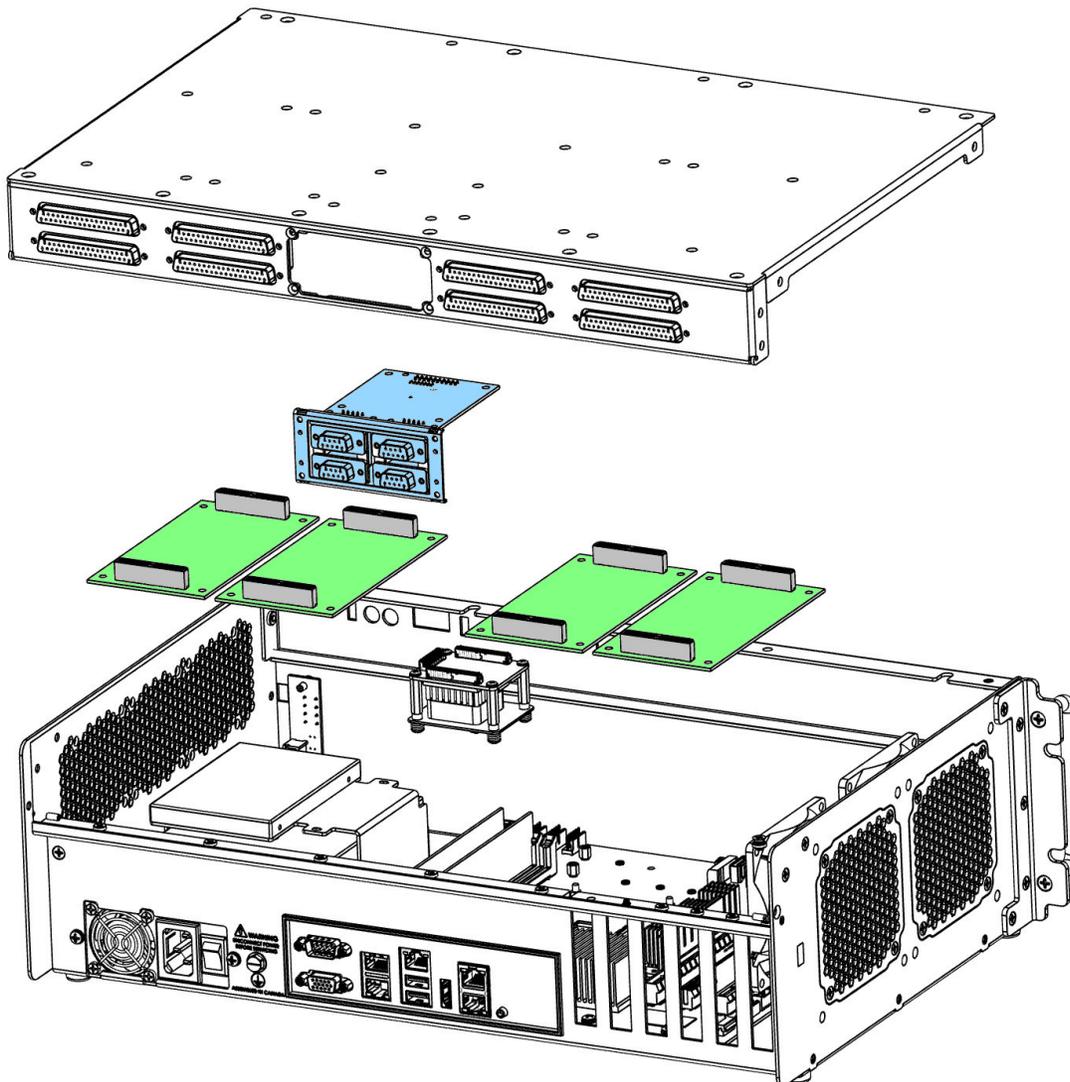
- 2 free PCIe slots
- Standard computer ports. See section [OP4610XG Simulator Specifications](#) for details.
- The **upper section** contains the high-speed **FPGA** and the **I/O modules with conditioning** for up to 128 I/Os. It includes:
  - A Xilinx® Kintex®-7 FPGA programmable from the target computer via PCIe. The FPGA is used to execute models designed with the OPAL-RT RT-XSG toolbox, manage the I/O lines and execute embedded FPGA-based simulations. It exchanges data with the real-time simulations running on the target computer CPUs via the PCIe link, an 8-slot flat carrier board capable of connecting any combination of up to 4 digital or analog conditioning modules.
  - Each module controls 16 or 32 I/O analog or digital channels, for a total of up to 128 channels.
  - 4 SFP ports for high-speed communication with other FPGA-based systems or with external devices. The standard communication protocols available with the OP4610XG are based on Xilinx Aurora (1 to 5 Gbps). Other protocols, such as the Gigabit Ethernet, can also be implemented.
    - These SFP ports can be used to expand the simulator I/O capability using OPAL-RT's **Multi-System Expansion link (MuSE)**: each port can be connected to one OPAL-RT remote I/O unit (OP4520, OP5607, OP5650, OP5705-IO, OP5707-IO), effectively increasing the simulator I/O capability to a maximum of 1024 channels.
    - SFP ports not used for MuSE remain compatible with the legacy Generic Aurora link. The MuSE link is compatible with OPAL-RT boards' I/O management architecture.

## Modular configuration

The OP4610XG can contain **up to 4 I/O modules** (colored in green), according to the user's needs.

All I/O modules are factory installed. Changes can only be made by OPAL-RT, its affiliates and certified distributors. Opening the simulator case **will automatically void the warranty**.

Many combinations of compatible I/O modules are possible. Please refer to the [Compatibility chart](#). Check for a typical configuration in the [section below](#).



## Typical I/O modules configuration

This is typical I/O modules configuration and is provided as an **example only**.

This example shows the use of two (2) OP5330-3 16 Channels Analog Output Modules (total of 32 analog output channels), one (1) OP5342 6 Analog Channel Input module and one (1) OP5369 32 Digital I/O module.

I/O Module	Description (model number)	I/O module quick specifications
I/O Module 1	16 Analog Output ( <a href="#">OP5330-3</a> )	16 channels analog output, 1 MS/s (16 channels) or 2 MS/s (8 channels), 16-bit resolution, 15 mA, $\pm 16$ V
I/O Module 2	Same as above	Same as above
I/O Module 3	16 Analog Input ( <a href="#">OP5342</a> )	16 channels analog input, 2 MS/s, 16-bit resolution, 500 ns, $\pm 20$ V
I/O Module 4	32 Digital I/O ( <a href="#">OP5369</a> )	32 channels high range digital input output, Digital out: 50 mA per channel, 5-24 V push pull FET, Digital in: 0-30 V, DIO selectable per group of 8 channels, 32 static digital.

The OP4610XG offers **two types of synchronization**, either **LVDS** or **fiber-optic**, making it easier to synchronize with any OPAL-RT device.