

# Gigabit Ethernet Core

GigE Vision® compliant IP Core for Xilinx Spartan and Virtex devices

GigE Vision® is a standardized communication protocol for vision applications based on the well known Ethernet technology. It allows easy interfacing between GigE Vision® devices and PCs running TCP/IP protocol.

Sensor to Image offers a set of IP cores and a development framework to build FPGA-based products with Gigabit Ethernet interface.

In principle there are two possibilities to realize systems with Gigabit Ethernet interfaces:

- use processor with Gigabit Ethernet interface
- use hardware - based solution

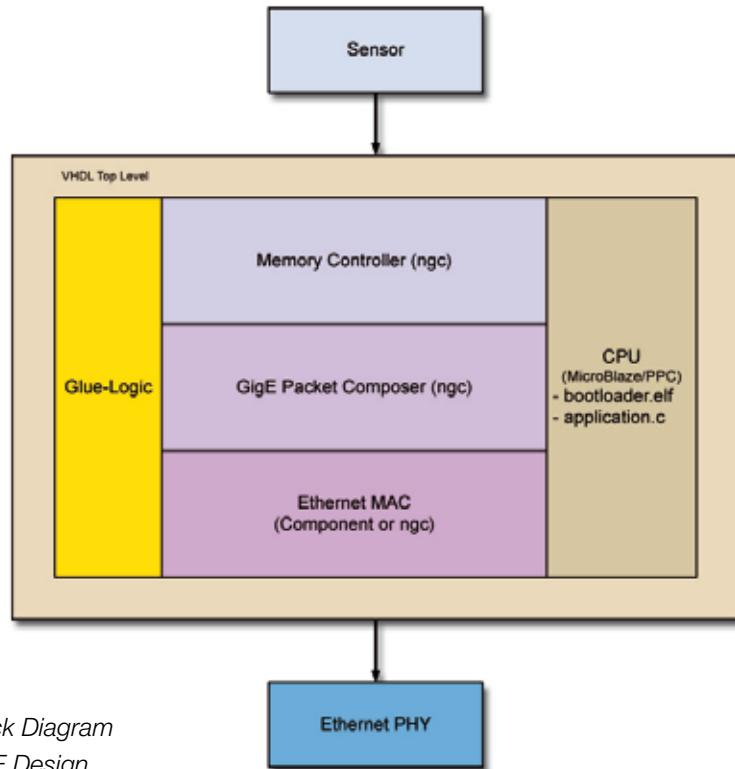
Sensor to Image developed a mixture of both concepts to combine advantages and avoid disadvantages of each approach.

This solution consists of a set of FPGA IP cores, which allows a maximum in performance at a small footprint and enough flexibility to realize custom solutions.

The following components are part of the design:

**Top Level Design**, which builds the interface between real hardware (e.g. sensor, external CPU, Ethernet Physical) and internal data processing. This module is delivered in source-code (VHDL), so it can be adapted and extended to custom hardware.

**Memory Controller** for different memory types, which allows frame buffering and image partitioning. This



Block Diagram  
GigE Design

is necessary to realize the packet resend function.

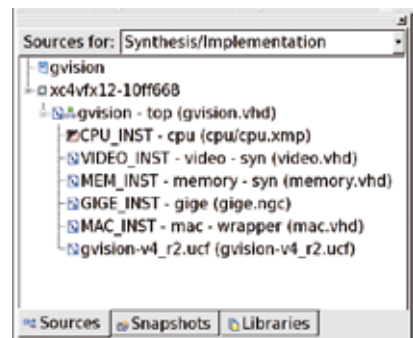
The **GigE Packet Composer** sends all data to the Ethernet MAC and realizes the high speed "Streaming Channel" according to the GigE Vision® specification.

An **FPGA integrated CPU** (PowerPC or MicroBlaze) is for several non time critical network and configuration tasks and it runs the "Control Channel". Software is written in C and can be extended by the customer. Some software parts are delivered as compiled files only (e.g. boot-loader, GigE-controller), other parts are in source code.

The delivered design framework comes with all necessary design files and cores, ISE and EDK project

files and a Gigabit Ethernet camera system with Xilinx FPGA and CMOS imager. This system should be used as reference design and evaluation board.

As development environment the Xilinx ISE and EDK is used (not in scope of delivery).



ISE Project Tree

AVAILABLE MODULES		SPARTAN 3/6	VIRTEX 4/5/6
MODULE	COMMENT		
Sync. bus as sensor interface incl. I <sup>2</sup> C/SPI core + C code	incl. 1 single tap sensor adaption	•	•
CameraLink incl. RS232 core + C code	base/medium incl. 1 single tap base camera adaption	•	•
GigE Core	project licence for CPU interface, packet composer, MAC interface, packet resend including SDRAM controller or MPMC interface	•	•
Tri Mode MAC	Ethernet MAC core, only full-duplex supported	•	
GigE Vision/GenICam software	Image Manager incl. filter driver, Transport Layer API, XML-File generation (Product and Service of Stemmer Imaging GmbH)		
Full sources, design, ...	on request		

other FPGA vendors on request

RESOURCES		SPARTAN3E	SPARTAN3A	SPARTAN6	VIRTEX5	VIRTEX6
<b>GigE Packet Composer</b>						
– Slice registers		3572	3759	3542	3128	3549
– Slice lookup tables		4746	4940	4058	3751	4151
– Block RAMs		11	11	11	7	6
– Maximum clock frequency*		105 MHz	102 MHz	155 MHz	113 MHz	221 MHz
<b>Framebuffer</b>						
– Slice registers		1654	2254	2486	2165	2416
– Slice lookup tables		2418	2871	2266	2331	2197
– Block RAMs		2	1	1	1	1
– Maximum clock frequency		102 MHz	103 MHz	188 MHz	126 MHz	276 MHz
<b>CPU system based on MicroBlaze processor</b>						
– Slice registers		1479	4826	2797	4616	4750
– Slice lookup tables		2224	4892	2959	4012	4264
– BlockRAMs		4	23	14	16	16
– Operating clock frequency		83.33 MHz	83.33 MHz	83.33 MHz	83.33 MHz	83.33 MHz
<b>MAC</b>						
– eMACs		–	–	–	1	1
– Slice registers		557	546	599	–	–
– Slice lookup tables		864	852	676	–	–
– BlockRAMs		–	–	–	–	–
– Maximum clock frequency		125 MHz	125 MHz	125 MHz	125 MHz	125 MHz
* 80 MHz required to reach maximum bandwidth of Gigabit Ethernet						

values are post synthesize only and based on platform specific reference designs, other architectures might have different resource usage



**Sensor to Image GmbH**  
 Lechtorstraße 20  
 D-86956 Schongau · Germany  
 Phone: +49 88 61-23 69-0  
 Fax: +49 88 61-23 69-69  
 email@sensor-to-image.de