Xilinx Industrial Networking

Networked devices and machines are essential in today's automated factory floors, and deterministic communication is key for high throughput and quality in a production line. Xilinx solutions combine the technology for true real time connectivity with protocol implementations from leaders in industrial communication. Included protocols are Profinet, Profibus, EtherCAT, Powerlink, EtherNet/IP and more.

Xilinx FPGA, System on Chip (SoC), IP Cores and reference designs provide a complete platform for developing the right networking solution needed for industrial automation.
### Device Table

<table>
<thead>
<tr>
<th>Device Name</th>
<th>Product #</th>
<th>Logic</th>
<th>CPU</th>
<th>MHz</th>
<th>Package Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artix®-7</td>
<td>A35T – A200T</td>
<td>35kLC – 200kLC</td>
<td>Microblaze</td>
<td>100MHz</td>
<td>10x10 – 17x17</td>
</tr>
<tr>
<td>Zynq®</td>
<td>7010 – 7030</td>
<td>28kLC – 125kLC</td>
<td>Dual Cortex™ A9 + Neon and Microblaze</td>
<td>Max 667MHz - 866 MHz for Cortex A9</td>
<td>13x13 – 19x19</td>
</tr>
<tr>
<td>Spartan®-6</td>
<td>LX16, LX75</td>
<td>16kLC – 75kLC</td>
<td>Microblaze</td>
<td>80MHz</td>
<td>8x8 – 19x19</td>
</tr>
</tbody>
</table>

### Selected Development Kits

Development boards and versatile extension cards for network ports form the backbone for reference systems. A special focus is given to Ethernet-based solutions with multiple external ports.

<table>
<thead>
<tr>
<th>Xilinx Development Kits</th>
<th>Features</th>
<th>Cost</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xilinx EK-A7-AC701-G</td>
<td>Artix-7 FPGA Evaluation Kit featuring the XC7A200T FPGA with 215k LC</td>
<td>$1,295</td>
<td>Avnet</td>
</tr>
<tr>
<td>Avnet AES-A7EV-7A50T-G</td>
<td>Avnet Artix-7 50T FPGA Evaluation Kit with two on-board Ethernet network ports</td>
<td>$239</td>
<td>Avnet</td>
</tr>
<tr>
<td>Xilinx EK-Z7-ZC702-G</td>
<td>Zynq-7000 All Programmable SoC Evaluation Kit featuring the Zynq-7020 SoC FPGA and dual ARM® Cortex A9 CPUs with 85k Programmable Logic</td>
<td>$895</td>
<td>Avnet</td>
</tr>
<tr>
<td>Avnet Zedboard AES-Z7EV-7Z020-G</td>
<td>Zynq-7000 All Programmable SoC Development Kit featuring the Zynq-7020 SoC FPGA, dual ARM Cortex A9 CPUs with 85k LC Programmable Logic</td>
<td>$395</td>
<td>Avnet</td>
</tr>
<tr>
<td>Avnet AES-S6EV-LX16-G</td>
<td>Avnet Spartan-6 LX16 FPGA Evaluation Kit</td>
<td>$225</td>
<td>Avnet</td>
</tr>
</tbody>
</table>

**FMC Cards for networking**

| Avnet AES-FMC-1SMNET-G | Avnet ISM Networking FMC Module with two individual 10/100 BaseT Ethernet ports for Industrial Networking | $250   | Avnet  |

**SOMs**

| Enclustra Mercury ZX family (ME-ZX1-xx-xx-xxx) | System on Module with one Gigabit Ethernet and two Fast Ethernet ports, based on the Zynq-7030/35/45. | EUR 440 (Carrier board: EUR) | Enclustra |
| SMARTzyng | Zynq-7000 based 5 Port Gigabit Ethernet Industrial Embedded Switch Module. | | SoC-e |
IP Libraries for Motor Control

Xilinx Alliance Members offer powerful communication solutions for industrial applications on Xilinx devices and tailor them to any application’s need for making most of the flexibility of All Programmable architectures.

### Reference Designs

#### Anybus IP from HMS
- Avnet Zedboard, uses the Zynq-7020 All Programmable SoC
- Avnet ISMNET with two networking ports
- PMOD Flash
- Reference design with Anybus IP, Anybus EDK (drivers) and a simple example application
- Runs with commercial network controllers as well as software-based controllers

#### Profinet RT/IRT on Zynq-7000 from Enclustra
- Avnet Zedboard, uses the Zynq-7020 All Programmable SoC
- Avnet ISMNET industrial networking FMC module with two Ethernet network ports
- Reference design with a demo application
- Utilizes Profinet protocol stack from Molex
- Runs with Siemens S7 controllers

#### Fast EtherCAT Drive on Xilinx ZC702 from QDESYS
- Xilinx ZC702, uses the Zynq-7020 All Programmable SoC and can host two FMC boards
- Avnet FMC MC1, dual motors, 3 phases power stage board
- Avnet ISMNET Industrial Networking FMC module with two Ethernet network ports
- Reference design implements a 2 motor drive, controlled via EtherCAT™
- Implements diagnostic interface to API running on PC (with Beckhoffs TwinCat™) or PLC, supporting LabVIEW, Mathworks, SciLab, C++ and Visual Basic

#### Profinet RT/IRT on Artix-7 from Softing
- Xilinx AC701, uses Artix-7 200T FPGA
- Avnet ISMNET industrial networking FMC module with two Ethernet network ports
- Reference design with a demo application

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**Name** | **Protocol** | **Type** | **Provider** | **Availability** | **Device Family Support**
---|---|---|---|---|---
**Multiprotocol Solutions**
Anybus IP & - Profinet RT/IRT - EtherNet/IP - EtherCAT | Slave | HMS Industrial Networks | Available | Zynq-7000 2016: Artix-7
**Single Protocol Solutions**
Profinet RT/IRT | Device | Enclustra | Available | Zynq-7000, Artix-7
Profinet RT/IRT | Device | Softing | Available | Artix-7
Profinet IO | Device | Port GmbH | Available | Zynq-7000, Spartan-6
Ethernet/IP | Adapter | Enclustra | Q1/2016 | Zynq-7000, Artix-7
EtherCAT | Slave | Beckhoff | Available | Zynq-7000, Artix-7, Spartan-6
EtherCAT | Master | HMS, based on acontis | Available | Zynq-7000
SERCOS III | Slave + Master | Sercos International e.V. / Cannon Automata | Available | Spartan-6
CC-Link IE | Slave | inrevium | On Request | Zynq-7000
Mechatrolink III | Slave + Master | inrevium | On Request | Zynq-7000
ProfiBus DP | Device | Adescom | On request | Device independent HDL IP
CANopen | SW protocol | HMS | On Request |
Design Tools & Methodologies

**Vivado Design Suite**
The Vivado® Design Suite delivers a SoC-strength, IP-centric and system-centric, next generation development environment that has been built from the ground up to address the productivity bottlenecks in system-level integration and implementation.

**Digital Design Using Vivado® IP**
Xilinx has developed a basic functional IP blocks library which can be used to create digital designs in a schematic view. The tutorial and laboratory exercises are created and available for use with the Xilinx University Program supported boards.

**SDSoC Development Environment**
The SDSoC™ development environment provides a greatly simplified ASSP-like C/C++ programming experience including an easy to use Eclipse IDE and a comprehensive design environment for heterogeneous Zynq® All Programmable SoC and MPSoC deployment. Complete with the industry's first C/C++ full-system optimizing compiler, SDSoC delivers system level profiling, automated software acceleration in programmable logic, automated system connectivity generation, and libraries to speed programming.

**Partner Profiles**

**Cannon Automata**
AUTOMATA is the official “SERCOS III FPGA solution center” of SERCOS International, the world wide user organization of the FPGA based real-time Ethernet standard SERCOS III. AUTOMATA is responsible for the maintenance and further development of the SERCOS III technology and technical support for users.

**Beckhoff Automation**
Beckhoff is focused on providing advanced control solutions based upon proven COTS technologies to allow users to design high performance automation systems at a lower overall cost in systems and engineering - by simplifying the overall architectures and engineering processes.

**Enclustra**
Enclustra provides services covering the whole range of FPGA-based system development: From high-speed hardware or HDL firmware through to embedded software, from specification and implementation through to prototype production.

**HMS Industrial Networks**
HMS products, solutions and know-how enable industrial machinery to get connected to systems and networks.

**Port**
Port GmbH develops and distributes progressive, high-quality IP products and engineering services in the area of industrial communications especially for CAN, CANopen, DeviceNet and Industrial Ethernet.

**Qdesys**
QDESYS designs, develop and produces industrial embedded systems. Specialized in motor control, control systems, and industrial networking. QDESYS produces original design and custom designs.

**SoC-e**
SoC-e develops IP cores, SoMs and boards and delivers Design Services for the application in Energy, Industrial Automation, and Transportation.

**Softing**
Softing is a worldwide leading specialist in industrial data communication such as fieldbus technologies and industrial Ethernet.

**Tokyo Electron Device Ltd**
Inrevium is the Design Service brand of Tokyo Electron Device, which offers FPGA platform solutions, market specific IPs, Technical Support and Design Services to our worldwide customers through our global sales and distribution partners. Tokyo Electron Device’s portfolio is complemented by FMC daughter cards, customized IP and Kits.

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