FPGA Platforms:
Why the Arista 7130 is best of breed

Traditionally building an FPGA application was a complex effort. It required competency in hardware design, electrical engineering, software development, system administration, and more. There was no standard platform: either an FPGA add-in card needed to be purchased and set up in a server or a single-function bespoke device was purchased.

Arista has changed the traditional experience by building a generic feature-rich platform and opening it up for development. Arista provides it's customer the same development framework Arista uses internally to build their own custom applications.

Features available in the Arista 7130 FPGA platform include:

- Devices with 32 ports (1 RU), 48 ports (1 RU) or 96 ports (2 RU) supporting 1/10 GbE all connected to a fully-meshed Layer 1+ switch
- Per port features such as Ethernet statistics and the integrated ability to monitor the port's eye pattern
- Ability to replicate any stream to another port or ports for capture/analytics
- A fully-integrated x86 management CPU running Linux
- Telemetry and counters sampled every second available in a local time-series database
- Multiple Xilinx FPGA options
- OCXO and Atomic (Rubidium) Clock Modules
- FPGA-based applications such as MetaMux, MetaWatch and MultiAccess

- Development kits and IP Cores to deploy custom and 3rd party applications

Features alone are only part of the story however. We focused at an early stage on the process of bringing complete products to market; ensuring that they were stable, documented, fully supportable and subject to regular maintenance and upgrades. The products are supported by experienced engineers and developers with full access to all of the internal resources required to provide the best possible client experience.

The Arista 7130 FPGA platform

Arista's 7130 FPGA platforms all inherit the benefits of the 7130 Layer 1+ network devices coupled with an FPGA development kit allowing end-users to deploy their own FPGA applications on the devices. The FPGA platforms are divided into the 7130L and 7130E Series. Each series is available in a 32 port (1 RU), 48 port (1 RU) or 96 port (2 RU) chassis.

The series differ in the number and type of FPGA modules used:

- E Series devices are available with either one or three Xilinx Kintex UltraScale KU095 or Virtex UltraScale+ VU9P FPGAs
- L Series devices combine a Xilinx UltraScale+ FPGA (VU7P-2 or VU9P-3) with 32GB of DDR4 memory for application flexibility and non-blocking deep buffering

All Arista 7130 FPGA platforms integrate a self-contained x86 server, Layer 1+ switch and FPGA module in a dense 1 RU or 2 RU device. From a device management perspective, there are a number of options including an industry standard CLI, built-in support for industry standard authentication and automation tools, a Web UI as well as a REST API. Essentially the FPGA platforms are designed to look and feel like a network device and unlike most component solutions (FPGA card in server) and as such does not require custom built monitoring and management solutions.

Arista 7130 FPGA platforms are ideal to support applications across multiple industries such as reconfigurable computing, high performance network applications, machine learning, medical electronics, network bandwidth shaping and management, video compression, ultra-fast data storage and retrieval, programmable networking and geoscience applications.

Arista FPGA platforms are in use today by a number of communication service providers to accelerate their network processing power, leading ultra-low-latency software vendors such as Enyx to provide their clients bandwidth and link optimisation as well as by leading electronic trading firms to run their proprietary in-house developed applications such as data distribution, trading algorithms and risk management checks.
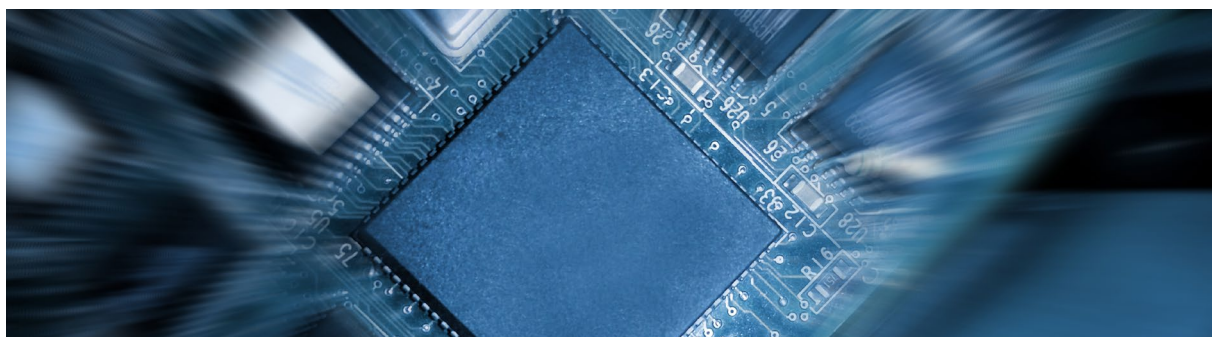
An integrated FPGA platform

1. FPGA Development Kit

The fully-supported Arista 7130 FPGA development kit offers:

- Full support for Vivado (Xilinx) toolchains
- Monitoring and debugging from the management processor or remotely via on-board JTAG chain
- Programming the FPGA from the management processor, or via dedicated configuration flash memory
- An abstraction of the 1/10 GbE SFP/SFP+ interfaces via the Layer 1+ switch taking care of signal integrity with negligible impact on latency
- A full range of network, core, and time synchronisation clocks
- PCI Express 2.0 and Ethernet interfaces between the management processor and FPGA

2. Platform

As an integrated platform the combination of the x86 management processor, FPGA, and Layer 1+ switch allows the ability to leverage:

- The Layer 1 switch to broadcast a stream to multiple FPGA transceivers for parallel processing
- The management processor to wrap up the FPGA image as an "application" RPM for ease of deployment
- The management processor to deploy applications locally leveraging the Linux APIs and configuration management tools
- Up to 96 individual 1/10 GbE FPGA transceivers

3. Specialist Use Cases

- Low latency algorithmic decision making
- Application aware router with up to 96 ports
- Customizable application level firewall
- High precision network analytics and telemetry platform
- Line rate traffic generation and traffic replay

4. Factors to consider when building an FPGA-based product

As an integrated platform the combination of the x86 management processor, FPGA, and Layer 1+ switch allows the ability to leverage:

- Fully integrated or requires a server to host it
- Integrated with a Layer 1 switch offering flexible stream distribution and replication options
- Ethernet port density
- Power and cooling
- Footprint in physical rack units
- Are JTAG dongles for programming, monitoring and debugging the FPGA required
- Software support, software updates, interoperability, combined hardware/software support

In Summary - Why the Arista 7130 is best of breed

- Arista has established itself in a wide range of sectors, including electronic trading, government/defense and telecommunications as a leading vendor of Layer 1+ switches and software with class-leading reliability, features and support

- For third-parties and end-users wishing to deploy their own FPGA applications on a device, there are several series of FPGA devices available, each comprising a self-contained x86 server, Layer 1+ Switch and up to three FPGA modules in a port-dense 1 RU or 2 RU device

- These FPGA devices start at 32 FPGA transceivers in a single RU making them extremely attractive for custom FPGA-based networking and networked applications

- Arista provides support for end-user FPGA applications and deployment via its FPGA development kits

- Implementers have a broad range of options for device management and monitoring, application deployment, configuration management and automation

- Clients deploying FPGA applications to Arista 7130 FPGA devices benefit from an off-the-shelf, stable and supported platform, offering flexible management to underpin their applications

- Many of the most technically-adept electronic trading firms and national markets rely on Arista 7130 switches to connect their trading servers to trading venues – a testament to the reliability and quality of Arista devices in critical environments

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