Atomic Rules Arkville Data Mover for Intel® Agilex

July 2022 Update

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Atomic Rules Background

Atomic Rules is a supplier of mission-critical, enterprise-grade IP cores and solutions – from the datacenter to the edge.

Atomic Rules IP for Agilex

- Arkville Data Mover – Effortless FPGA/Host data motion - This Presentation!
- TimeServoPTP – Coherent FPGA Time with PTP/1588v2 and Intel Nios®V
- UDP Offload Engine – UDP in hardware for any line rate

Atomic Rules Turnkey Solutions – No FPGA Programming Required

- TK242 200 GbE Lossless Packet Capture
What is Arkville?

Atomic Rules Arkville is a complete solution to FPGA application data motion. Arkville provides the **software and hardware infrastructure** to **move data between FPGA and HOST user-space memory in a trusted and performant manner**.

Arkville Value Propositions:

- **Trusted Solution** – 20 quarters of vetting with the Linux Foundation and dpdk.org
- **Performant Solution** - Both High Throughput and Low Latency
  - Up to 800 Gbps (100 GBytes/Sec) useful net throughput with PCIe Gen5 – per slot
- **Complete Solution** – Standard SW and HW APIs
- **Proven Solution** – Rich set of out-of-the-box example designs
- **Current Solution** – Continuous support for the latest release, with every release
Arkville Key Deliverables

Host Software
- Application examples
- Scripts to validate throughput and latency
- Open-source libraries and kernel drivers from The Linux Foundation’s dpdk.org

FPGA Hardware
- Arkville RTL is licensed from Atomic Rules
- FPGA Example designs provided use standard AXI interfaces
- Build scripts for latest Quartus Prime Pro
Arkville Developer Benefits

Software Developer
- Use open-source trusted drivers and APIs from The Linux Foundation’s dpdk.org
- Zero-Copy data access to/from user-land memory
- Container-ready and aware – Root Privilege not needed

Hardware Developer
- Standard AXI Hardware Interfaces
- Out-of-the-box Performance with Intel Agilex devices
- Extensive testing and examples with the latest version of Intel Quartus Prime Pro

Application Developer
- Develop applications in RTL or Domain Specific Language (DSL)
- Reduced Time-to-Solution by using Arkville’s standard APIs and Interfaces
- Deploy accelerated containerized applications with Arkville
Two Agilex I-Series Test Setups

Archer City -> Sapphire Rapids
- SPR SKU, DDR5 8-channels
- Asus Z690A -> Alder Lake
  - I9-12900K, DDR5 2-channels

Host Software
- Ubuntu 20.04 LTS, DPDK 22.07
- Arkville 22.07 Poll Mode Driver (PMD)

FPGA Hardware
- Intel AGI Development Board
- Arkville 22.07 RTL

Capabilities
- Dual PCIe Gen5x8 (bifurcated Gen5x8x2)
- Four simultaneous 200 Gbps flows
Two Arkville Test Systems for Agilex I-Series

**Archer City / Sapphire Rapids**
- Intel AGI Dev Card

**Alder Lake (ar-12900k)**
- Intel AGI Dev Card
Arkville Net Throughput vs Packet Size - Agilex I-Series Gen5x8 – A0 Alder Lake

- **Device To Host (D2H)**
- **Host to Device (H2D)**

**Work in Progress - Net Performance Data**
SW application-level net observed throughput
Dual Gen5x8 Endpoints - Intel AGI Dev Card
This test sweep shows the net throughput of one of the two Gen5x8 PCIe endpoints
Four Steps to explore Arkville on your bench...

1. Mutual NDA so Arkville can be shared as Confidential Material
2. Follow Arkville Quick Start Guide to install required packages
3. Either build new bitstreams from RTL, or download prebuilt ones
4. Run testpmd and other user space applications

Elapsed time – an hour or less! Compare and contrast this with writing your own kernel drivers, applications, and RTL
Arkville 22.07 – Available August 22

- Virtualization and Containerization Support
  - Move data to and from Containers without the need for Root Privilege
  - Increased security without loss of performance through IOMMU

- Support for Intel Agilex I-Series Devices (Gen5 PCIe)
  - Up to four discrete 25 GB/S (200 Gbps) packetized streams per I-Series R-Tile

- Numerous RTL and PMD Enhancements
  - New example designs for Quartus 22.2
  - Full support for DPDK 22.07
Learn More

Get Started:

• Contact your local Intel Sales Rep for more information and an Arkville demonstration

Documentation:

• Web page, Partner page, Arkville Poll Mode Driver (PMD), Webinar

• Intel, Atomic Rules and BittWare pre-recorded Dec 2021 webinar here