Lagopus FPGA - a reprogrammable data plane for high-performance software SDN switches
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1. What is SDN* and why?
- Innovate network services and applications in software development speed
- Decouple network control and forwarding functions
- OpenFlow is a foundational protocol for building SDN

2. What is Lagopus vSwitch?
- The best OpenFlow 1.3 compliant software switch
- High-performance packet processing over 10Gbps
- Elastic network flow control for 1M flow entries
- Works on commodity IA server and NIC
- Scalable flow dispatcher for NFV* applications

Open source software download: http://lagopus.github.io/

3. Packet processing on multi-core CPUs
- Explicit thread assignment to CPU core
- Decouple I/O processing and flow processing

4. Issues of CPU centralized processing
- No offloading functions w/ general purpose NIC
- Cannot fully utilize multi-core CPU power

Our approach: optimize high-performance, elastic software data plane with CPU + FPGA architecture

5. Designing concept and architecture
- Provide high-performance and advance features
- Hardware accelaration for NFV applications
- Ensuring flexible control and management

6. FPGA flow classification & dispatch empowered by SDNet and flow director
- 256-bit@250MHz FPGA data path parallelly forwards packets to x86 via DMA
- Preprocessing match filter by DPDK* flow director
- Accelerating high-intensity data plane operations

7. Performance vs. Power Dissipation
- Enhancing performance to 40Gbps with less than 10% x86 CPU power dissipation

8. Demonstration
- Lagopus FPGA design: 7W
- Hot Chips 27@Cupertino
- Total: 425W
- 64G, 128G, 256G, 384G, 512G, 1T/2T/4T DDR3-1600 ECC (Mibridge Xilinx: 65nm Virtex-7 XC7VX690T)

9. Conclusion and future work
- To accelerate carrier NFV applications
- To explore 100-Gbps-capable software packet processing-aware architecture

*SDN: Software-Defined Networking  *NFV: Network Functions Virtualization  *DPDK: Data Plane Development Kit  *PMD: Poll Mode Driver