The Rise of Hardware Accelerators and its Gaps

Big Data and Machine Learning are being adopted by enterprises as a means of creating competitive advantage. Companies who want to get ahead of the pack in their industry are investing heavily in infrastructure aimed at turning raw data into business value.

To meet this near-insatiable computational demand, companies have traditionally used Scale-up or Scale-out strategies.

Scale up and scale out strategies can work effectively for smaller workloads, but they run into diminishing return on investment when cluster sizes or server sizes grow larger, resulting in slower pace of innovation and business value derived by enterprises.

To meet this challenge, the data analytics industry has turned to hardware accelerators. For example, AWS and Azure have introduced FPGA instances in their clouds. Google has developed the Tensorflow library, with the goal of high performance.

However, the key issue raised by hardware acceleration is a programming model gap, illustrated by Figure 1.

Today there is no automated way for BIG Data platforms to leverage advanced Field Programmable hardware. Consequently, the Data Scientists and Performance Engineers must fill the Programming Model Gap illustrated in Figure 1. Even though this is feasible, it is typically very inefficient and time consuming.

Data scientists, developers and quants are accustomed to programming using big data platforms in a high-level language. These Analytics Developers are focused on creating best of the breed domain specific analytics.

The performance engineering team are skilled at programming Field Programmable Hardware. The scarcity of Performance engineering resources, along with the additional implementation time needed can significantly lengthen time to value. Additionally, making even slightest changes to the resulting analytics often requires significant reengineering effort.
**SOLUTION: BIGSTREAM’S HYPER-ACCELERATION-LAYER**

Bigstream technology was architected to address this programming model gap. The basic architecture for Bigstream’s acceleration is illustrated in Figure 2.

Bigstream Hyper-acceleration layer automates the process of acceleration for the users of big data platforms. It is comprised of compiler technology for software acceleration via native C++, and FPGA acceleration templates. As shown in the Figure 2, the automatic compilation of user code for acceleration yields between a 2x-30x factor in performance, but with zero user code change.

Bigstream is the only solution in the market that:

- Does not require customers to make any code changes. This is accomplished via automated programming of applications onto the FPGA. The result is lower risk and faster time to production.
- Accelerates every step of a Big Data Pipeline, achieving the highest levels of end-to-end speedup.
- Leverages both CPU And FPGA hardware simultaneously to provide optimal performance.

**SOLUTION BENEFITS**

**Time-to-Insight**

For many use cases, customers are limited in their ability to iterate their analytics more frequently to manage risk, optimize revenue, or improve customer engagement. Bigstream’s acceleration technology enables customers to run their models up to an order of magnitude faster to achieve their business objectives. This is especially important in delay sensitive applications that require a much smaller time scale.

**TCO Savings**

Doing more with less. Companies want to expand their analytics applications, run them more frequently and leverage larger data sets. But each of these translate to major increase in infrastructure cost. This cost involves charges by cloud providers, or in the case of on-premises deployment, involves cost of hardware, power, cooling and additional personnel. Bigstream acceleration can result in savings of 30-70%.

**Faster Pace of Innovation**

The scarcity and cost of employing Data Scientists limits the pace of innovation in enterprises. Acceleration of workloads during development and operation frees up Data Scientists to take on more innovative initiatives, driving competitive advantage.

**Target Use Cases**

Bigstream’s current product focuses on acceleration of Spark Platform in the following use cases:

- ETL
- Streaming analytics: Spark Streaming, Kafka
- SQL Analytics: Hive or Spark SQL