**Talk Proposal:** Event-Driven Packet Processing

The rise of P4 programmable devices has sparked an interest in developing new applications for packet processing data-planes. Unfortunately, the application developers have only met with limited success. The bane of designing data-plane applications is that they must satisfy the strict constraints of the underlying hardware, which makes it difficult to implement complex stateful processing logic. These challenges are exacerbated by the fact that modern programmable data-plane architectures support a very small collection of events. Typically, packet arrivals, packet departures, and recirculation events. In this talk, we observe that network applications are inherently event-driven and as such, our programmable data-plane hardware should also be event-driven. By identifying a set of useful data-plane events and outlining a new hardware architecture to support them, we demonstrate how we can achieve an unprecedented level of programmability without sacrificing performance.

In particular, this talk will focus on how event-driven architectures enable us to programmatically derive congestion signals, which can then be used to implement Active Queue Management (AQM) policies. Congestion signals such as queue length, queue service rate, queueing delay, and packet loss volume are hard coded into today's network devices. This makes it challenging to implement AQM policies that use different congestion signals such as per-active-flow buffer occupancy, rate of change of the queue length, or timestamps for buffer overflow/underflow events. There are also many other congestion signals that we have yet to conceive. In fact, the availability of congestion signals benefits many data-plane algorithms in addition to AQM. For example, congestion control, load balancing, and network telemetry. We show how event-driven architectures provide us with a way to programmatically derive congestion signals rather than hard coding them.

**Presenter: Stephen Ibanez** is a PhD Candidate at Stanford University working with Professor Nick McKeown as well as Gordon Brebner at Xilinx Labs. His research focuses on improving the programmability of network devices in two key areas: traffic management and stateful packet processing. He leads the programmable traffic management sub-working group within P4.org. He has hosted numerous P4 related tutorials at venues including SIGCOMM and P4 Workshops, and he also leads the P4→NetFPGA community of developers and users.