

Company background

[Ciena](#) is a North American-based networking company specializing in high-capacity, highly reliable, deterministic networks typically using fiber-optic modem technology. The company produces hardware products that employ DWDM, OTN, carrier ethernet, MPLS, and routing / segment routing (SR). The company also produces software products that are used to plan, manage, and operate networks within and beyond the Ciena product portfolio. Ciena offers services to plan, deploy, operate, and upgrade networks.

A description of the work to be done

Classically, ethernet frame processing within ethernet switches or routers is done by dedicated hardware. With highly scalable general-purpose low-cost compute it is now possible to use off-the-shelf servers running Linux to perform some of these functions. Typical literature points to Data Plane Development Kit ([DPDK](#)). Common applications include virtual switch/routers using Vector Packet Processing ([VPP](#)).

Packet-based services are unreliable presence of congestion or faults. To improve the reliability of packet-based services, additional frames are injected into the flow to aid in detecting congestion or faults. Typical options include Bidirectional Forwarding Detection ([BFD](#)), [Y.1731](#) (for Ethernet Operations, Administration and Maintenance (OAM) functions), and [RFC2544](#) used to measure and report the performance.

Ciena would like to see a high-performance open-source SW implementation of various packet OAM protocols. (millions of packets/second/CPU thread) The solution should use Linux containers on a modern Linux kernel on a x86 CPU (Intel/AMD) . Industry literature indicates that eXpress Data Path ([XDP](#)) employing Berkeley Packet Filter ([BPF](#)) or enhanced BPF (eBPF) looks like the best implementation direction. I find the use of higher-level language (like [Go](#)) to implement the functions to be very attractive. Protocol testing could be done using Wireshark. Currently I do not have a thought on performance testing (outside of an external test set). The solution should implement counters and such to monitor the protocol performance.

Any desired skill set for the students (but remember that students are expected to learn new technologies/languages as part of the course)

Linux Kernel, Linux networking, Linux containers, Go, networking protocols, designing high performance applications, github, test driven design / design for testability.

Preferred team size. Probably a range, we prefer projects that can support at least three students.

3-4 students.