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Kubernetes service load-balancing at scale with BPF & XDP

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With the incredible pace of containerisation in enterprises, the combination of Linux and Kubernetes as an orchestration base layer is often considered as *the* "cloud OS". In this talk we provide a deep dive on Kubernetes's service abstraction and related to it the path of getting external network traffic into one's cluster.

With this understanding in mind, we then discuss issues and shortcomings of the existing kube-proxy implementation in Kubernetes for larger scale and high churn environments and how it can be replaced entirely with the help of Cilium by utilising BPF and XDP. Cilium's service load-balancing architecture consists of two main components, that is, BPF at the socket layer for handling East-West traffic and BPF at the driver layer for processing the North-South traffic path.

Given XDP has only recently been added to Cilium in order to accelerate service load-balancing, we'll discuss our path towards implementing the latter, lessons learned, provide a detailed performance analysis compared to kube-proxy in terms of forwarding cost as well as CPU consumption, and future extensions on kernel side.

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Primary authors: BORKMANN, Daniel (Cilium.io); PUMPUTIS, Martynas (Cilium)

Presenters: BORKMANN, Daniel (Cilium.io); PUMPUTIS, Martynas (Cilium)

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