# Why (and How) Networks Should Run Themselves

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## ABSTRACT

The proliferation of networked devices, systems, and applications that we depend on every day makes managing networks more important than ever. The increasing security, availability, and performance demands of these applications suggest that these increasingly difficult network management problems be solved in real time, across a complex web of interacting protocols and systems. Alas, just as the importance of network management has increased, the network has grown so complex that it is seemingly unmanageable. In this new era, network management requires a fundamentally new approach. Instead of optimizations based on closed-form analysis of individual protocols, network operators need data-driven, machine-learning-based models of end-to-end and application performance based on high-level policy goals and a holistic view of the underlying components. Instead of anomaly detection algorithms that operate on offline analysis of network traces, operators need classification and detection algorithms that can make real-time, closed-loop decisions. Networks should learn to drive themselves. This paper explores this concept, discussing how we might attain this ambitious goal by more closely coupling measurement with real-time control and by relying on learning for inference and prediction about a networked application or system, as opposed to closed-form analysis of individual protocols.

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