ParaNets: a parallel network architecture for the future internet

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The evolution of networking technologies and portable devices has led users to expect connectivity anytime and everywhere. We have reached the point of seeing networking occur underwater, via aerial devices, and across space. While researchers push the true boundaries of networking to serve a wide range of environments, there is the challenge of providing robust network connectivity beyond the boundaries of the core internet, defined by fiber optics and well-organized backbones. As the internet edges expand, the expectation is that connectivity will be as good, in terms of high bandwidth and minimal interruption, as anywhere in the core. Such an expectation contradicts the inherent nature of connectivity at the edges.

Researchers have been trying to solve this problem primarily by layering more network connection opportunities using newer technologies such as WiFi, WiMax, and cellular networks. The result is not better robustness, just more of the same. The choice of which network to use is somewhat dependent on location, partially driven by economics, and ultimately decided by the user.

Our goal is to create a research thrust that builds robust networking at the edge of the internet by integrating various network technologies. These technologies should ultimately enable users to more seamlessly connect to the internet. Mobile devices and the applications running on them are currently incapable of identifying various potential communication opportunities and seamlessly utilizing them in order to maximize throughput. Furthermore, these applications should be capable of utilizing these connection opportunities in parallel, be resilient to disruptions, and optimize this utilization pattern to rising cost and energy concerns.

This overall objective requires fundamentally re-working the internet's connectivity model to exploit the array of networking opportunities and evolve the traditional protocol stack to a more dynamic plug-and-play stack.