Editor’s Message: What is a Network?

As a networking researcher, working with computer networks day in and day out, you probably have rarely paused to reflect on the surprisingly difficult question of "What is a network?" For example, would you consider a bio-chemical system to be a network? How about a social network? Or a water supply network? Or the electrical grid? After all, all of these share some aspects in common with a computer network: they can be represented as a graph and they carry a flow (of chemical signals, messages, water, and electrons, respectively) from one or more sources to one or more destinations. So, shouldn't we make them equally objects of study by SIGCOMM members?

You could argue that some of these networks differ dramatically from the Internet. The water network, for example, does not carry any messages and is unidirectional. So, it is not a communication network, unlike the Internet or, perhaps, a social network. This implicitly takes the position that the only networks we (as computer networking researchers) ought to study are bi-directional communication networks. This is a conservative position that is relatively easy to justify, but it excludes from consideration some interesting and open research questions that arise in the context of these other networks. Choosing the capacity of a water tank or an electrical transformer turns out to be similar in many respects to choosing the capacity of a router buffer or a transmission link. Similarly, one could imagine that the round-trip-time on a social network (the time it takes for a rumour you started to get back to you by word of mouth) would inform you about the structure of social network in much the same way as an ICMP ping. For these reasons, a more open-minded view about the nature of a network may be both pragmatic and conducive to innovation.

My own view is that a network is any system that can be naturally represented by a graph. Additionally, a communication network is any system where a flow that originates at some set of source nodes is delivered to some set of destination nodes typically due to the forwarding action of intermediate nodes (although this may not be strictly necessary). This broad definition encompasses water networks, biological networks, and electrical networks as well as telecommunication networks and the Internet. It seeks to present a unifying abstraction so that techniques developed in one form of network can be adopted by researchers in the others.

Besides a broad definition of networks, like the one above, the integrative study of networks—or ‘Network Science’ as its proponents call it—requires the underlying communities (and there are more than one) to be open to ideas from each other, and for the publication fora in these communities to be likewise “liberal in what you accept,” in Jon Postel's famous words. This is essential to allow researchers in Network Science to carry ideas from one community to another, despite their being less than expert in certain aspects of their work. CCR, through its publication of non-peer-reviewed Editorials, is perfectly positioned to follow this principle.

I will end with a couple of important announcements. First, this issue will mark the end of Stefan Saroiu's tenure as an Area Editor. His steady editorial hand will be much missed. Thanks, Stefan!

Second, starting September 1, 2012, Dina Papagiannaki will take over as the new Editor of CCR. Dina has demonstrated a breadth of understanding and depth of vision that assures me that CCR will be in very good hands. I am confident that under her stewardship CCR will rise to ever greater heights. I wish her the very best.

S. Keshav
CCR Editor