Internet Challenges

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The Internet is a hugely successful human made artifact that has changed the society fundamentally. Consider the *effect a prolonged outage* of the Internet would have: (1) Some of our kids and peers wouldn't know anymore how to interact with their peers and how to spend their leisure time as they increasingly rely on social networks, online games, YouTube, and other online entertainment offers. (2) Manufacturing would hit a roadblock as the communication path within and between companies increasingly relies on the Internet. (3) Control of critical infrastructures may become a problem as it starts to increasingly rely on the Internet for gathering input data and propagating control information.

Internet providers no longer compete on the simple grounds of connectivity. It should be their desire to provide reasonable predictable performance given that demands for quality of service guarantees are growing. However, this entails understanding a number of things about IP traffic which are difficult to capture. Providing input to the understanding of the traffic and its evolution can lead to provisioning, both for reasonably predictable best effort services, but also in the future for some novel network services perhaps based on differentiation and so forth.

Initially, the Internet was mainly about communication. Nowadays, it is about *communication, computation, and storage*. IT-cloud providers, e. g., Amazon, offer new abilities by offering computation and storage. But they don't stop there but also start to provide „on demand" connectivity from the user to the cloud. Since data in the cloud is no good without access to it. Thus, we observe two opposite trends: On the one hand companies tend to build isolated ecosystems to limit the impact of competitors and bind as many customers as possible. On the other hand ISPs and CDNs build infrastructures that can be combined to host flexible ecosystems.

The Internet relies on collaboration and presumes that all users act in the common interest of the community. This worked well in the beginning when the Internet was mainly used by the scientific community. Unfortunately, the assumption of collaboration is no longer true in general.

Part of the success of the early Internet is that it relied on „working code and rough consensus". Indeed, the fact that open source software had an integrated IP network stack made the Internet a very attractive option and it lead to many proposals on how to improve the base technology. Unfortunately, today the situation is not quite as simple anymore as the performance requirements require custom hardware solutions. This has lead to specialized closed box solutions for the main components of the Internet – the routers and switches. One of the main reasons for the ossification of the current Internet. Software defined networking is one proposal to tackle this problem. One of the key concepts of software defined networking is to expose a programmable interface to the key components of the Internet

This special issue of IT-Heft is aimed at capturing some of the state-of-the-art work in. Thus, we selected the following papers for inclusion in this IT-Heft. What is interesting to note is that these really show how much we are still in the early phase of addressing the challenges that the Internet faces moving forward.

The first article, by S. Uhlig et al., on „Recent Changes in the Internet Landscape", gives an excellent overview over the ongoing trends in the Internet and how it has lead to the concept of software defined networking. The second article, by P. Tran-Gia et al. on „Crowdsourcing and its Impact on Future Internet Usage" outlines how novel applications and business ideas may require even further changes to the Internet architecture. The third paper by D. Perouli et al. on „An Experimental Framework for BGP Security Evaluation" tackles one of the many security problems in the Internet. The forth paper by S. Schmid et al. on „A Federated CloudNet Architecture: The PIP and the VNP Role" outlines how a prototype of a cloudnet architecture that offers virtualized infrastructures to novel applications may look like.

We hope you will enjoy reading the articles in this special issue. There are still many unresolved issues that need to be addressed before we can hope to address all

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the challenges facing the future Internet. The guest editors thanks the authors for their contributions and the reviewers for their efforts in improving the quality and readability of the articles.

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