

WASP: A Centrally Managed Communication Layer for Smart Phone Networks

(poster and demo)

Murad Kaplan (student), Chenyu Zheng (student), Eric Keller
University of Colorado
{murad.kaplan,chenyu.zheng,eric.keller}@colorado.edu

With the rapid adoption of powerful smart phones, the demand for content rich media is greatly increasing. This can quickly overload the cellular network's capacity and, of more concern to the user, quickly expend the limited bandwidth cap.

To overcome these challenges, we propose WASP (shown in Figure 1), named for the technologies it encompasses (Wi-Fi, Ad-Hoc, SDN, and Phones). WASP is a communication layer within a smart phone which couples cellular connections with direct phone-to-phone links (over Wi-Fi direct). With WASP we are inspired by ideas from software-defined networking [2] and the control over the routing and interconnection of the network of phones. This is not only more efficient (e.g., the phones do not need to participate in an ad-hoc routing protocol), it also leads to network wide benefits as the centralized controller can determine a solution with a global view – saving both cellular bandwidth and battery (local, short range wireless requires less power than over a wide-area cellular connection such as LTE).

Layered on top of the communication layer, WASP provides services for aiding applications with different content distribution requirements. The *streaming service* provides an efficient distribution mechanism to a group of phones receiving the same stream. The controller calculates an efficient and fair multi-rooted multi-cast tree to distribute the stream (similar to SplitStream [1]), and sets this into the routing tables of each of the involved phones. The *web content service* uses peer-to-peer content serving of cached content similar to Firecoral [3], but as a general service not tied to the browser. In this case, the controller also acts as a look up mechanism to track which phones are caching content, make suggestions as to which phones to request the content from, and enabling direct communication to fetch that content. The *direct messaging service* uses the communication layer to allow an application (e.g., instant messaging, photo sharing, or file synchronization) to directly send content to another phone.

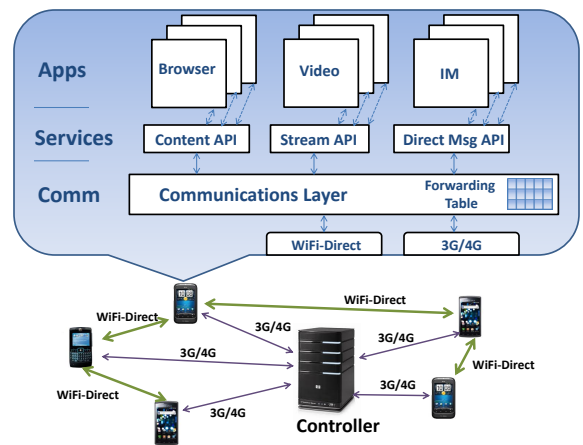


Figure 1: WASP architecture.

In this poster we will present the design and implementation of WASP and discuss the design space enabled by this new SDN-based model. We will provide a demonstration from a small scale collection of phones, to a larger scale simulation of the Android application within ns-3, and finally a mixed-mode simulation involving real Android phones participating with the ns-3 based simulation. With this, we intend to explore the different design options for the communication layer.

References

- [1] M. Castro, P. Druschel, A.-M. Kermarrec, A. Nandi, A. Rowstron, and A. Singh. Splitstream: high-bandwidth multicast in cooperative environments. In *SOSP*, 2003.
- [2] A. Greenberg, G. Hjalmtysson, D. A. Maltz, A. Myers, J. Rexford, G. Xie, H. Yan, J. Zhan, and H. Zhang. A clean slate 4d approach to network control and management. *SIGCOMM Comput. Commun. Rev.*, 35(5):41–54, Oct. 2005.
- [3] J. Terrace, H. Laidlaw, H. E. Liu, S. Stern, and M. J. Freedman. Bringing P2P to the Web: Security and Privacy in the Firecoral Network. In *IPTPS*, 2009.