MicroCast: Cooperative Video Streaming on Smartphones

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1. EXTENDED ABSTRACT

In this work, we are interested in a scenario where a group of smartphone users, within proximity of each other, are interested in watching the same video at the same time. The default operation today is that each user with a cellular connection streams the video independently from the server. However, each phone's individual cellular connection may not be sufficient for providing high video quality. Fortunately, the scenario where users engage in a group activity, naturally lends itself to cooperation.

We propose a novel cooperative scheme, called *MicroCast*, for video streaming to a group of smartphones within proximity of each other. Each phone utilizes simultaneously two network interfaces: one (cellular) to connect to the video server and download parts of the video; and the other (WiFi) to connect to the rest of the group and exchange downloaded parts. Fig. 1 illustrates MicroCast scenario.

Key ingredients of our design include the following. First, we propose a scheduling algorithm, MicroDownload, that decides which parts of the video each phone should download from the server, based on the phones' download rate. Second, we propose a novel all-to-all local dissemination scheme, MicroNC-P2, for sharing content among group members, which outperforms state-of-the-art peer-to-peer schemes in our setting. MicroNC-P2 is explicitly designed to exploit WiFi overhearing and network coding, based on a local broadcast framework, MicroBroadcast, which we developed specifically for Android phones. The full architecture of MicroCast is depicted in Fig. 2.

To the best of our knowledge, MicroBroadcast is the first framework that allows smartphones to broadcast in high speed locally. MicroCast is our first application that exploits this framework. We envision that MicroBroadcast will enable a new class of applications which exploit local all-to-all communication on mobile phones to provide rich interactive experience, such as games that support multiple players through just local connectivity.

We perform performance evaluation on a testbed consisting of several Android phones, and we show that each component separately as well as the combined system as a whole significantly improve the performance compared to alternative approaches. Furthermore, this improvement comes at no significant battery cost. If accepted, we will show a live **demo** of MicroCast on several Nexus S phones. The demo will demonstrate the decreased download time as well as the decreased amount of local traffic. More supporting materials and a preliminary demo can be found in [1].

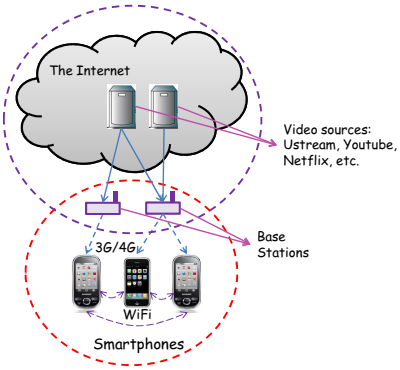

Figure 1: MicroCast scenario.

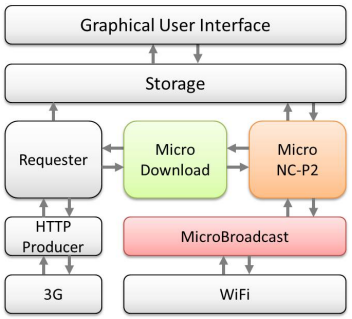

Figure 2: Architecture of MicroCast.

2. REFERENCES

[1] "Wireless network coding: from theory to practice," [Online] *http://odysseas.calit2.uci.edu/doku.php/public:muri09*.